THE

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

FOR THE YEAR

1896.

Vol. XXI.

WITH SIXTY-ONE PLATES.

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CONTENTS OF PROCEEDINGS, 1896.

PART I. (No. 81).

(Issued July 16th, 1896.)

* Issued separately as a Supplement to this Part.

PART II. (No. 82).

(Issued September 23rd, 1896.)

PART III. (No. 83).

PART III. *(continued).*

Note.—On pp. 378, 380, and 381, *for* Plate XXII. *read* Plate XXI.; and *for* Plate XXIII., *read* Plate XXII.

PART IV. (No. 84.)

(Issued May 31st, 1897.)

PART IV. *(continued).*

[redacted]

CORRIGENDA.

Page 50, after line 20 add—Pl. vi. figs. 4-7.

Page 71, line 32—for *schomburghii* and *hayi* read *schomburgkii* and *kayi*.

Page 85, line 16—for *C. albitarsis* read *E. albitarsis*.

Page 150, line 14—for *C. adelaidæ* read *C. tumidipes*.

Page 171, line 20—*for* clypeus *read* clypeal.

Page 173, line 20—for *Ceratoglossus* read *Ceratoglossa*.

Page 180—omit line 2.

Page 181, line 5—omit "South Australia," et seq.

Page 182, line 27—for *C. adelaidæ* read *C. tumidipes*.

Page 195, line 18—for *C. adelaidæ*, Blk., read *C. tumidipes*, Sl.

Page 253, line 7—for *C. adelaidæ* read *C. tumidipes*.

Page 253, line 27—*for* on *read* in.

Page 254, line 29—for *C. adelaidæ* read *C. tumidipes*.

Page 255, line 31—for *C. tenuipes* read *C. gracilipes*.

Page 314, line 24—*for* PUNCTULATUM *read* PUNCTULATUS.

Page 326, line 11—*for* Tome xlvii. *read* Tome xlii.

Page 345, line 30—for *Canthurus* read *Cantharus*.

Page 351, line 3—for *Canthurus* read *Cantharus*.

Page 378, line 5—*for* Plates xxii.-xxiii. *read* Plates xxi.-xxii.

Page 378, line 7—*for* Plate xxii. *read* Plate xxi.

Page 380, line 3—*for* Plate xxiii. *read* Plate xxii.

Page 381, line 10—*for* Plate xxii. *read* Plate xxi.; *for* Plate xxiii. *read* Plate xxii.

Page 381, line 19—*for* Plate xxiii. *read* Plate xxii.

Page 430, line 8—for *philicifolia* read *phylicifolia*.

Page 430, line 23—for *A. ixophylla* read *A. ixiophylla*.

Page 537, line 9—for *bruneicornis* read *brunneicórnis*.

Page 567, line 13—for *Pipettelella* read *Pipettella*.

Page 758, line 25—*for* Naturliche *read* Natürliche.

LIST OF PLATES.

PROCEEDINGS 1896.

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

WEDNESDAY, 25TH MARCH, 1896.

The Ordinary Monthly Meeting of the Society was held in the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, March 25th, 1896.

The President, Henry Deane, Esq., M.A., F.L.S., in the Chair.

The President gave notice that upon requisition he convened a Special General Meeting to be held on April 29th, to take precedence of the Monthly Meeting. *Business:* The Hon. Treasurer to move for the insertion in Rule xxiii. of an additional clause providing for the countersigning of all cheques drawn on behalf of the Society.

DONATIONS.

(Received since the Meeting in November, 1895.)

Manchester Museum, Owens College—Studies in Biology. Vol. iii. (1895): Catalogue of the Hadfield Collection of Shells from the Loyalty Islands. *From the Museum.*

Perak Government Gazette. Vol. viii. Nos. 27-31 (Oct.-Dec. 1895); Vol. ix. Nos. 1-3 (Jan. 1896). *From the Government Secretary.*

Royal Society of Victoria—Transactions. Vol. iv. (1895). *From the Society.*

Imperial University, Japan—Calendar, 1894-95. *From the President.*

College of Science, Imperial University, Japan—Journal. Vol ix. Part 1 (1895). *From the Director.*

Société Royale Linnéenne de Bruxelles—Bulletin. 21me. Année. Nos. 1-3. (Nov. 1895-Jan. 1896). *From the Society.*

McAlpine's "Systematic Arrangement of Australian Fungi, together with Host-Index and List of Works on the Subject." (4to. 1895). *From the Trustees of the Free Public Library, Melbourne.*

Geological Society, London—Quarterly Journal. Vol. li. Part 4 (No. 204, Nov. 1895): Vol. lii. Part 1 (No. 205, Feb. 1896): Geological Literature, &c., 1895. *From the Society.*

Zoologischer Anzeiger. xviii. Jahrg. Nos. 487-492 (Oct.-Dec. 1895); xix. Bd Nos. 493-495 (Jan.-Feb. 1896). *From the Editor.*

Hamilton Association—Journal and Proceedings for 1894-95. *From the Association.*

Geological Survey of Canada—Palæozoic Fossils. Vol. i. (1861-65); Vol. ii. Part i. (1874); Vol. iii. Parts i.-ii. (1884 and 1895): Maps of the Principal Auriferous Creeks in the Cariboo Mining District, British Columbia, Nos. 364-372, 379-390 and 550-551: Sheet No. 11, S. W. Nova Scotia: Eastern Townships Map—Quebec. N.-E. Quarter Sheet; Rainy River Sheet—Ontario. *From the Director.*

American Museum of Natural History—Bulletin. Vol. vii. (1895), Sig. 20-24, pp. 305-388 (Sept.-Dec. 1895). *From the Museum.*

Department of Mines, Perth, W. A.—"Mining Handbook to the Colony of Western Australia." 2nd Edition (1895). By H. P. Woodward, J.P., F.G.S. *From the Secretary for Mines.*

Bureau of Agriculture, Perth, W. A.—Journal. Vol. ii. Nos. 25-27 (Nov.-Dec. 1895); Vol. iii. Nos. 1-5 (Jan.-Mar. 1896). *From the Secretary.*

Naturwissenschaftlicher Verein zu Osnabrück—Jahresbericht, 1893-94. *From the Society.*

Michigan Fish Commission—Bulletin. No. 5 (1895). *From the Commission.*

Harvard College, Cambridge, Mass.—Bulletin of the Museum of Comparative Zoology. Vol. xxvii. Nos. 4-6 (Aug.-Nov. 1895): Annual Report of the Curator, 1894-95. *From the Curator.*

Asiatic Society of Bengal—Journal. n.s. Vol. lxiv. (1895), Part i. No. 2: Proceedings, 1895. Nos. vii.-viii. (July-Aug.). *From the Society.*

Société de Physique et d' Histoire Naturelle de Genève—Mémoires. T. xxxii. Première Partie (1894-95). *From the Society.*

Royal Microscopical Society—Journal. 1895. Parts 5 and 6 (Oct. and Dec.). *From the Society.*

Geological Survey of India—Records. Vol. xxviii. Part 4 (1895). *From the Director.*

Hooker's "Icones Plantarum." (Fourth Series). Vol. v. Parts i.-ii. (Nov. 1895-Jan. 1896). *From the Bentham Trustees.*

K. K. Zoologisch-botanische Gesellschaft in Wien—Verhandlungen. Jahrgang, 1895. xlv. Band 8-10 Hefte. *From the Society.*

Australasian Journal of Pharmacy. Vol. x. No. 120 (Dec. 1895); Vol. xi. Nos. 121-123 (Jan.-Mar. 1896). *From the Editor.*

Pharmaceutical Journal of Australasia. Vol. viii. Nos. 11-12. (Nov.-Dec. 1895); Vol. ix. Nos. 1-2 (Jan.-Feb. 1896). *From the Editor.*

Pamphlet entitled "Stratigraphical Notes on the Georgina Basin," &c. (1895). By R. L. Jack, F.G.S., F.R.G.S. *From the Author.*

Nederlandsche Entomologische Vereeniging—Tijdschrift voor Entomologie. Deel xxxviii. Afl. i. (1894-95). *From the Society.*

L'Académie Impériale des Sciences de St. Pétersbourg—Bulletin. v^e. Série. T. ii. No. 5 (May, 1895); T. iii. No. 1

[redacted]

Zoological Society, London—Abstracts. 19th Nov., 3rd Dec., 17th Dec. 1895, 14th Jan. 1896, Feb. 4th : Proceedings, 1895. Part iii. : Transactions. Vol. xiii. Part 11 (Oct. 1895). *From the Society.*

Royal Society of South Australia—Transactions. Vol. xix. Part ii. (Dec. 1895). *From the Society.*

Société Royale de Géographie d'Anvers — Bulletin. T. xx. 2^{me}-3^{me} Fascs. (1895-96) : Mémoires. T. iv. *From the Society.*

Department of Agriculture, Sydney—Agricultural Gazette. Vol. vi. Parts 11-12 (Nov.-Dec. 1895); Vol. vii. Parts 1-2 (Jan.-Feb. 1896). *From the Hon. the Minister for Mines and Agriculture.*

Johns Hopkins University Circulars. Vol. xv. No. 121 (Oct. 1895). *From the University.*

Naturwissenschaftlicher Verein des Reg.-Bez., Frankfurt a/O. —Helios. xiii. Jahrg. 1895. Nos. 1-6 (Ap.-Sept.): Societatum Litteræ. ix. Jahrg. 1895. Nos. 4-9 (Ap.-Sept.). *From the Society.*

Scottish Microscopical Society—Proceedings, 1894-95. *From the Society.*

Kaiserliche Mineralogische Gesellschaft, St. Pétersbourg—Materialien zur Geologie Russlands. Bd. xvii. (1895). *From the Society.*

U.S. Department of Agriculture—Division of Ornithology and Mammalogy—Bulletin. No. 6 (1895): Division of Entomology—Bulletin. n.s. Nos. 1-2 (1895). *From the Secretary of Agriculture.*

Connecticut Academy of Arts and Sciences—Transactions. Vols. i.-iii.; Vol. iv. Parts 1-2; Vols. v.-vi. (1866-85). *From the Academy.*

Bombay Natural History Society—Journal. Vol ix. No. 5; Vol. x. No. 1 (Oct.-Nov., 1895). *From the Society.*

Société Entomologique de Belgique—Annales. T. xxxvi. (1892); xxxviii. (1894): Mémoires. i. (1892). *From the Society.*

Pamphlet entitled "Analyses of the Artesian Waters of New South Wales," &c. By J. C. H. Mingaye, F.C.S. No. 2 (1895). *From the Author.*

Entomological Society of London—Proceedings, 1895. Parts iv.-v. *From the Society.*

Museo de La Plata—Revista. T. vi. Part ii. (1895). *From the Director.*

Australian Museum, Sydney—Records. Vol. ii. No. 7. (Jan., 1896). *From the Trustees.*

Académie Royale des Sciences et Lettres de Danemark, Copenhague—Bulletin Année, 1895. No. 2 (April-May). *From the Academy.*

Kongliga Svènska Vetenskaps-Akademie—Handlingar. Bd. xxvi. (1894-95): Bihang. Bd. xx. Afd. i.-iv. *From the Academy.*

Journal of Conchology. Vol. viii. No. 5 (Jan., 1896). *From the Conchological Society of Great Britain and Ireland.*

Naturhistorischer Verein der Preussischen Rheinlande, West- [redacted]

Société Royale Malacologique de Belgique—Annales. T. xxvii. (1892): Procès-Verbaux. T. xxi. (1892), pp. 75-86. (Nov.-Dec.); T. xxii. (1893); T. xxiii. (1894); T. xxiv. (1895), pp. 1-83 (Jan.-May). *From the Society.*

Société Nationale des Sci. Nat. et Math. de Cherbourg—Mémoires. T. xxix. (1892-95). *From the Society.*

Geelong Naturalist. Vol. v. No. 2 (Jan., 1896). *From the Geelong Field Naturalists' Club.*

Royal Society, London—Proceedings. Vol. lviii. Nos. 349-352 (Aug.-Nov., 1895); Vol. lix. No. 353 (Jan., 1896). *From the Society.*

Royal Irish Academy—Transactions. Vol. xxx. Parts 15-17 (Feb.-Dec., 1895): Proceedings. Third Series. Vol. iii. No. 4 (Dec., 1895): List of Members, 1895. *From the Academy.*

Entomologiska Föreningen i Stockholm—Entomologisk Tidskrift. Årg. 16, 1895. Häft 1-4. *From the Society.*

Queensland Geological Survey—Report on the Leichhardt Gold Field and other Mining Centres in the Cloncurry District. 1895 (No. 208). By W. H. Rands. *From the Director.*

Sydney Observatory—Results of Rain, River, and Evaporation Observations made in New South Wales during 1894 under the Direction of H. C. Russell, B.A., C.M.G., F.R.S., Govt. Astronomer. *From the Director.*

Bureau of American Ethnology—Bulletin W. (No. 23) [1894]. *From the Bureau.*

Public Library, Museums, and National Gallery, Melbourne—Report of the Trustees, 1894. *From the Trustees.*

University of Melbourne—Examination Papers: Matric. (Nov., 1895); Annual (Oct. and Dec., 1895). *From the University.*

Comité Geologique, St. Pétersbourg—Bulletin. Supplément au T. xiv., 1894: Mémoires. Vol. x. No. 4 (1895). *From the Committee.*

Department of Agriculture, Victoria—Three Reports by Messrs. Sinclair and Irvine: Guides to Growers, Nos. 6-7, 18-20, and 22. *From C. French, Esq., F.L.S.*

Gordon Technical College, Geelong—The Wombat. Vol. i. No. 2 (1895). *From the College.*

L'Institut Colonial de Marseille—Annales. Vol. ii. (1895). *From the Institution.*

Revista de Sciencias Naturaes e Sociaes. Vol. iv. No. 14 (1896). *From the Directors.*

OBSERVATIONS ON THE RELATIONS OF THE ORGAN OF JACOBSON IN THE HORSE.

By R. Broom, M.D., B.Sc.

(Plate I.)

In Herzfield's recent paper "Ueber das Jacobson'sche Organ des Menschen und der Säugethiere"* he calls attention to the peculiarity in the Horse in that in it there is no naso-palatine canal opening into the mouth, and that the duct of Jacobson, instead of opening into the naso-palatine canal as in most higher mammals, opens into a deep depression in the nasal floor. This condition he found to exist in both the Horse and the Ass, and he states that according to Gratiolet† a similar condition is found in the Camel and Giraffe.

As I had from my studies on the organ of Jacobson in different Orders come to the conclusion that though the degree of development of the organ may vary greatly in different genera the type on which it is formed is remarkably uniform in each Order, I naturally became anxious to find the explanation of how it was that the organ in the Horse differed apparently so remarkably from the normal Ungulate type as found in the Sheep.

Being fortunate in having in my possession the head of a fœtal Horse I have made a study of the relations of the organ by means of a series of vertical sections. Though the examination of a younger specimen would doubtless have been even more

* Zoolog. Jahrbuch, Abtheil. für Anatomie und Ontogenie. Bd. iii. 1889.

† Recherches sur l'organe de Jacobson. aris, 1845.

satisfactory, as the present series sufficiently elucidates the nature of the peculiarity, I think it well to publish the present results.

The Horse differs from most mammals in having the premaxillaries developed in such a way as to carry the palate forward in advance of the nares and forming a sort of rostrum—a condition seen in a much greater degree in the Tapir. As a result of this development a large portion of the anterior part of the nasal septum is clasped between the premaxillaries, and the lateral cartilages, which in most mammals become the "cartilages of the nasal floor," are here confined by the premaxillaries and prevented from developing laterally to any great degree, and seem to compensate for the want of lateral expansion by developing downwards.

Figure 1, Plate I., represents a section immediately behind the point where the premaxillary gives off its palatine process. A portion of the lateral cartilage (*l.c.*) is seen passing downwards from the nasal septum (*n.s.*) between the premaxillary and the palatine process. A little below it may be observed an oval cartilage cut across—this is an anterior process from the lateral cartilage. It passes well forward, approaching nearer to the palate, and ending a little behind the rudimentary papilla. The most noteworthy peculiarity of this section is that there is no [redacted]

In the next succeeding planes the relation of the duct to the cartilages is very similar, but the lateral cartilage is found becoming shorter and broader and detaching itself from the nasal septum (fig. 4).

On reaching the plane shown in fig. 5 the nasal cavity is found to be approaching the lateral cartilage, which here becomes for the first time a "nasal-floor cartilage" proper. At its outer angle it is seen sending up a process which further back is found to represent the rudimentary cartilage of the nasal wall. Here the naso-palatine canal is seen flattened out and about to give off Jacobson's duct. The inner part or Jacobson's duct is almost surrounded by cartilage.

In figure 6 the ducts are seen separated, and a cartilaginous partition passes between them.

In the following figure the outer part of the cartilage is seen detached, while the inner forms a complete investment for Jacobson's duct. Between the two portions of the divided lateral cartilage is found the naso-palatine canal about to open into the nasal cavity.

Behind this region the organ and its cartilages are found quite to follow the ordinary mammalian form.

It will be observed that the points in which the Horse differs from the normal type are these :—(1) occlusion or absence of the anterior part of the naso-palatine canal, leading to the secretion from Jacobson's organ passing backwards into the nasal cavity by the upper part of the naso-palatine canal; and 2) the anterior processes of cartilage usually given off from the nasal-floor or lateral cartilage and passing forward supporting Jacobson's duct and the naso-palatine canal, here for the greater part remain united with the lateral cartilage. In the absence of even a trace of the canal in its anterior part, it is doubtful whether the anterior cartilaginous process represents Jacobson's or Stenson's cartilages or a fusion of both—probably the latter.

In almost all other respects there is a close agreement between the condition of parts in the Horse and those in most other Ungulates.

Fig. 10 shows a section of part of the nose of a very small fœtal Calf. Here both Jacobson's and Stenson's cartilages are well developed and seem distinct from the broad nasal-floor cartilage. If this be compared with figures 4 or 5 the close resemblance will be seen; in fact the only marked difference is that in the Horse the cartilages of Jacobson and Stenson are united with the nasal-floor cartilage, in the Calf distinct. But all the corresponding parts can easily be observed.

Figure 11 represents a section of the fœtal Calf corresponding to figure 6 in the Horse. Here the duct cartilages are united with the nasal-floor cartilage as in the Horse. The resemblance is, however, somewhat marred by the enormous development of the cartilage of the nasal wall in the Calf. Such variations in cartilaginous development, however, occur in very nearly allied forms as the Cat and Dog.

The agreement of figure 12 with figure 8 is most striking.

The peculiarities in the Horse are probably due to the strong development of the premaxillary bones leading to the occlusion

REFERENCES TO PLATE I.

a.l.c., anterior process of lateral cartilage; *J.c.*, Jacobson's cartilage; *J.d.*, Jacobson's duct; *J.o.*, Jacobson's organ; *l.c.*, lateral cartilage; *Mx.*, maxillary; *n.f.c.*, nasal-floor cartilage; *n.p.c.*, naso-palatine canal; *n.w.c.*, nasal-wall cartilage; *n.s.*, nasal septum; *p.Pmx.*, palatine process of premaxillary; *Pmx.*, premaxillary.

Figs. 1- 9.—Transverse vertical sections through snout of fœtal Horse (head length about 7·5 c.m.) × 7.

Figs. 10-12.—Transverse vertical sections through snout of fœtal Calf (head length about 2 c.m.) × 30.

Dotted portion represents cartilage; parts shaded by lines represent the regions of ossification.

DESCRIPTIONS OF FURTHER HIGHLY ORNATE BOOMERANGS FROM NEW SOUTH WALES AND QUEENSLAND.

By R. Etheridge, Junr., Curator of the Australian Museum.

(Plates II.-V.)

The boomerangs described in the present communication may be regarded as supplementary to those of an ornate nature figured in these "Proceedings,"* and the "Macleay Memorial Volume."† They are from the collections of Dr. J. C. Cox, and Messrs. P. R. Pedley and N. Hardy, and my best thanks are due to these gentlemen for the loan of the weapons.

The first five boomerangs generally resemble one of those first referred to,‡ where the incised ornament consists of loops returned on themselves, either continuous along the whole length of the weapon or disconnected one from the other.

The most highly ornate of the five (Fig. 4) bears three incised loops formed by from three to five continuous grooves, the loops gradually increasing in length. The free end of the shortest loop commences near one of the apices of the weapon, passes down [redacted]

contact with the first return of the second loop, again returns on itself to the middle line of the boomerang, pursues its course along that plane, and terminates as it commenced in a free end; hence there are in this figure four turns to the left, and two to right. When there are more than three incised grooves, the additional ones are made by interpolation. Some of the interspaces of the loops are quite plain, one bears seven crosses in three and a half pairs, three others have continuous zig-zag incised lines, whilst outside the central loop on the convex side of the boomerang, the marginal space is occupied by a similar zig-zag, or almost festoon-like, figure of two incised grooves. One of the apices is similarly marked transversely, whilst the other is devoid of sculpture, but just within the return of the loop, and above the free end is a figure resembling an unsymmetrical letter W.

The length of this weapon across the curve is two feet four inches; the breadth two and a quarter inches; and the weight ten and a half ounces. It is from the collection of Mr. P. R. Pedley, and was obtained at St. George on the Balonne River, a branch of the Maranoa River, in South-east Queensland.

The second boomerang (Fig. 3) differs from Fig. 4 only in detail. The loops are identical in number and execution, but at the returning points instead of four deflections to the left and two to the right, there are two and four respectively. The interspaces are also sculptured in the same manner, although not within corresponding loops. The apices on the contrary are differently marked, both bearing a diagonal of four incised lines, the spaces on either side carrying sharp v-shaped figures.

The length is two feet four inches; the breadth two and a half inches; and the weight eleven ounces. It is from the same locality and collection as the last.

The third weapon (Fig. 2) resembles Fig. 3, except that only two loops have been incised, almost equally dividing the surface, with two deflections to the right and two to the left. Only one interspace bears a single zig-zag line, the others are devoid of sculpture. At one end the loop is contiguous to the apex, at the other the

free space beyond the return of the loops is occupied by sigmoidal figures of two incisions each, and a central gently lunate outline.

The length is two feet three and a quarter inches; the breadth two inches; and the weight nine ounces. It is from the same locality and collection as the two previous weapons.

The two succeeding boomerangs (Figs. 1 or 7) have disconnected loops, or rather half-loops placed back to back and touching in pairs. Cross bars are also present, but differ in the two weapons. In both the loops are formed of six undulating grooves, producing a figure along one margin of each weapon, then returning on itself, and proceeding along the other margin, leaving a wide space in the middle line. In Fig. 1 there are seven of these half loops, and in Fig 7 six. In Fig. 1 the apical half-loops are turned in opposite directions, and one is smaller than the other. That at one of the apices is cut off by a single incised transverse line, and is followed by two half loops abutting against one another, and again divided off near the middle of the weapons by another transverse incised line. Two further half-loops repeat the same order, separated by the third transverse incised line from the first large half-loop referred to as occupying one of the apical portions of the boomerang. The arrangement in Fig. 7 is practically the same, but in consequence of the penultimate apical half-loops being nearly of a size, the sculpture is almost bilaterally [redacted]

Both boomerangs are from Angeldool, on the Narran River, near the Queensland border, and are from the collection of Dr. J. C. Cox.

The next weapon to be described (Fig. 6) is well ornamented with four parallel series of small conjoined ovals, extending nearly the entire length of the boomerang, the two nearest the convex margin being the shortest. This margin is also scalloped. The ovals are obliquely incised with single grooves not all in the same direction, but the scalloped edge is plain.

The length is two feet eight inches; the breadth two and a quarter inches; and the weight thirteen ounces. It is from the same locality and collection as Figs. 1 and 7.

The original of Fig. 5 like that of Fig. 6 is a large boomerang, with the sculpture excellently done, consisting of a median line of six inequilateral rhombs, the intervening triangular spaces on each side being vertically incised with grooves. The surfaces of the rhombs are smooth, and devoid of sculpture, with the exception of the shaped nicks, in from one to four series in each rhomb, but too disjointed to assume a zig-zag pattern.

The length is two feet nine and a half inches; the breadth two and a half inches; and the weight thirteen and a half ounces. This example is also from Dr. Cox's Angeldool collection.

Fig. 8 represents a boomerang imperfect in itself, but exactly coinciding in its sculpture with one of those described by me from Norley, on the Bulloo River,* and therefore need not be described further. We have here either an example of wide distribution of a certain pattern of sculpture, or a case of a weapon passed on by barter. The specimen is again from Angeldool.

Deeply scalloped margins distinguish Fig. 12, the scalloping edged with a wide groove, and itself obliquely incised. The middle line or crown is quite smooth with the exception of a fluctuating or serpentine line of two grooves, fairly well coinciding in its fluctuations with the groove edging the scalloped figure on the

* Proc. Linn. Soc. N.S. Wales, 1894, ix. (2), t. 15, f. 2.

concave side of the weapon. The immediate apex at one end is cross-incised, and bears a few irregular v-shaped nicks.

The length is two feet three and a half inches; breadth two and a quarter inches; and the weight twelve ounces. It is from St. George, Balonne River (Mr. P. R. Pedley).

Fig. 10 is again a bilaterally unsymmetrical boomerang as regards the incised sculpture. There are three cross-bars formed of one obliquely cross-notched incised line. One of these is near the centre, another half way between this and one of the apices, and the third at the apex referred to, thus dividing the surface into three unequal lengths. The middle line bears acute small rhombs, extending throughout the two larger divisions. On each side the line of rhombs are the usual rolling or fluctuating grooves four to five on either side; whilst the middle line of the division unornamented by rhombs, is occupied by similar grooves. The apex at this end bears a transverse double zig-zag pattern, and a single similar series is intra-marginal on the convex side of the boomerang.

Length two feet three and a half inches; breadth two and a quarter inches; and the weight eleven ounces. This is a much shorter and more highly curved weapon.

St. George, Balonne River (Mr. P. R. Pedley).

The middle line of this boomerang (Fig. 11) instead of rhombs [redacted]

fluctuating grooves, four to six grooves in each range, one group in the middle line, and one on either side, extending from apex to apex, but twice interrupted by cross bars, that differ widely, however, from those figured on preceding weapons. That on one side of the centre consists of two parallel grooves, united by transverse incisions, the other near one of the apices of two such bands, somewhat separated from one another, the plain interspace carrying five v-shaped figures placed transversely. On the concave side of the boomerang, and along one part of the edge, is the ever-recurring single zig-zag line, whilst between the fluctuating lines over the general surface, either the same kind of incised sculpture or v-shaped figures parallel to the longer axis of the weapon.

Length two feet five and a half inches; breadth two and a quarter inches; and weight twelve and a half ounces. This boomerang was received from Normanton, Gulf of Carpentaria, by Mr. N. Hardy, to whom it belongs.

A very peculiarly ornamented boomerang is represented in Fig. 13. Along the convex margin is a series of very deep scallops, reaching transversely to near the middle line of the weapon, and grooved parallel to its longer axis. The middle or centre line is occupied by a single zig-zag, and between this and the concave edge are three deep and wide slightly fluctuating lines of two grooves each. The whole produces a very marked pattern. The apices in this weapon are very sharply pointed.

Length two feet six inches; width two inches; and weight ten ounces.

From Angeldool, on the Narran River, in the collection of Dr. J. C. Cox.

The last boomerang but two (Fig. 14) bears on each side of the sculptured face long moderately deep festoons, five on either side, and obliquely grooved, but not reaching to either apex. The middle line is occupied by five large ovals, so arranged that each more or less falls into the space left between opposite re-entering angles of the festoons. These are also deeply and obliquely grooved. Clear spaces are left at both apices, one containing two

and a half rhombs placed transversely, whilst at the other is an oblong enclosure, with two parallel zig-zags of a single line each.

Length two feet five inches; breadth two and a quarter inches; and weight eleven and a half ounces.

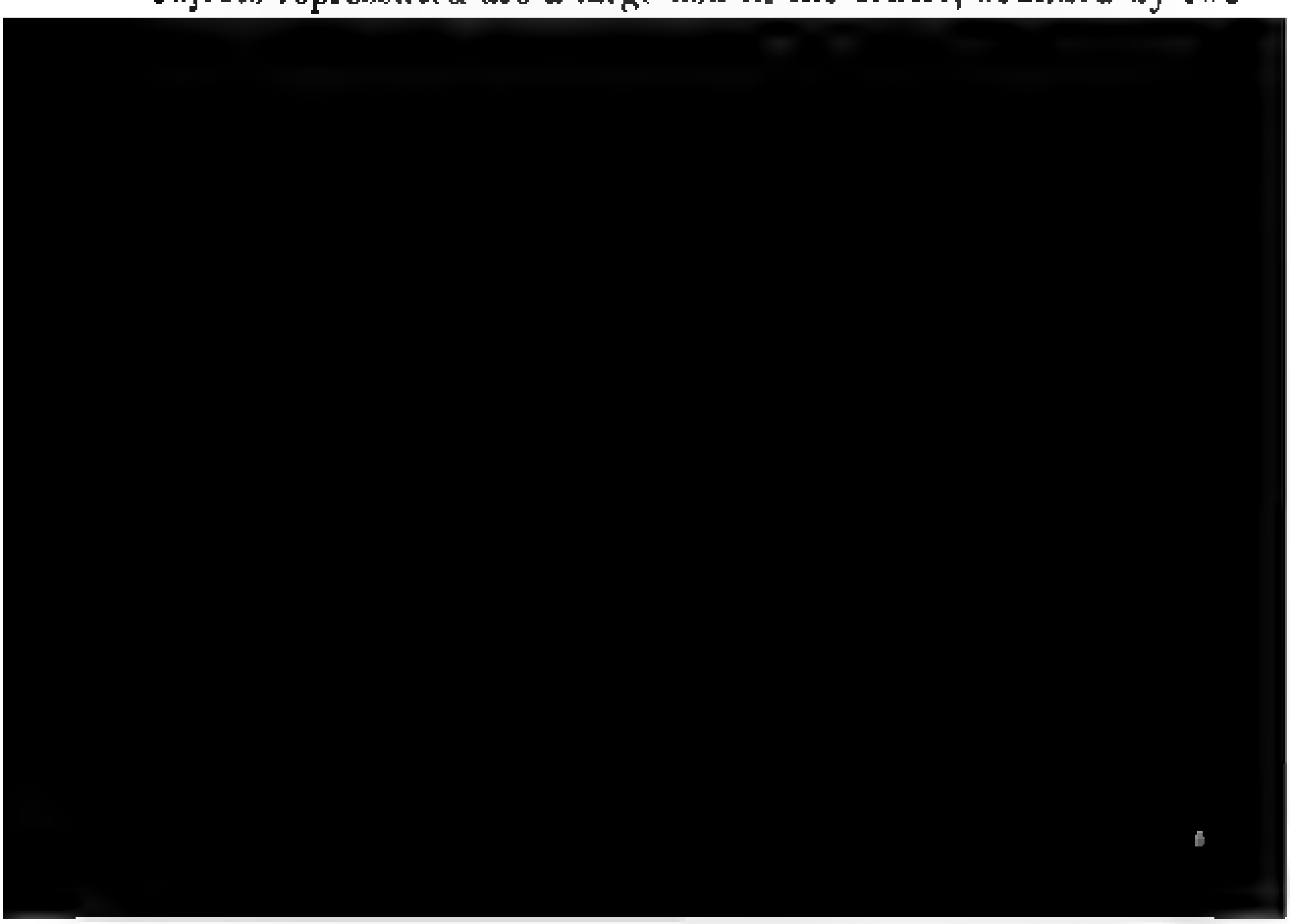
From Angeldool, on the Narran River, in the collection of Dr. J. C. Cox.

In the last specimen but one (Fig. 15) runs a sub-central longitudinal line of eleven large ovals, and along the concave and convex margins respectively rows of fifteen and eighteen narrower ovals. Intervening between the central row and that on the convex margin at one end of the weapon is an additional row of larger ovals, but this only extends for half the length of the weapon. At each end this larger row dies off into a single zig-zag line, whilst between the sub-central line of ovals and that on the concave margin is another. All the ovals are grooved obliquely.

Length two feet four inches; breadth two and a quarter inches; and weight eleven ounces.

Again from Angeldool, on the Narran River, and in the collection of Dr. J. C. Cox.

The last boomerang (Fig. 16) is figured with some hesitation, not as to the genuineness of the weapon itself, but of the carving; the former betrays nothing out of the common. The natural objects represented are a large fish in the centre, bounded by two



boomerang is the property of Mr. Norman Hardy, and is from Queensland.

Figs. 2 to 4 are obviously after the type of the ornamented boomerangs from the Bulloo River, figured by myself,* differing merely in minor details; the loop pattern is here paramount. I think it very possible also that the sculpture fore-shadowed on a boomerang from Queensland, figured by Smyth,† is only this pattern in an incomplete state. Knight figures‡ a boomerang exhibited at the Philadelphia International Exhibition, said in the same breath to be both from N.S. Wales and Victoria, and bearing those serpentine figures that are probably of the same nature.

Figs. 1 and 7.—The half-loops do not correspond to any previously published illustrations known to me. The weapon represented by Fig. 6 is to some extent allied in its pattern to another figured by Smyth,§ from Rockingham Bay, that from Coomooboolaroo given by Lumholtz,|| and one of those from the Alligator River Tableland, figured by myself in the Macleay Memorial Volume,¶ except that Fig. 6 is wanting in the marginal festoon work and possesses an additional row of ovals. Fig. 15 also stands in much the same relation.

The pattern of the broken boomerang, Fig. 8, again corresponds to one from the Bulloo River.**

The remainder of the figures are not related to any published forms so far as I know. Broken zig-zag double lines, as in Figs. 1, 7, 8, 15, &c., are by no means uncommon on aboriginal weapons, whilst crosses are very uncommon (see Fig. 11). For instance a Bull-roarer, figured by Angas, from S. Australia, and called *Wimmari*, is decorated in this manner.

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* Proc. Linn. Soc. N.S. Wales, 1894, ix. (2), t. 15, f. 1.

† Aborigines of Victoria, 1878, i., p. 285, f. 37.

‡ Smithsonian Ann. Report for 1879 [1880], p. 227, f. 28, lower fig.

§ Smyth, loc. cit. p. 329, f. 112.

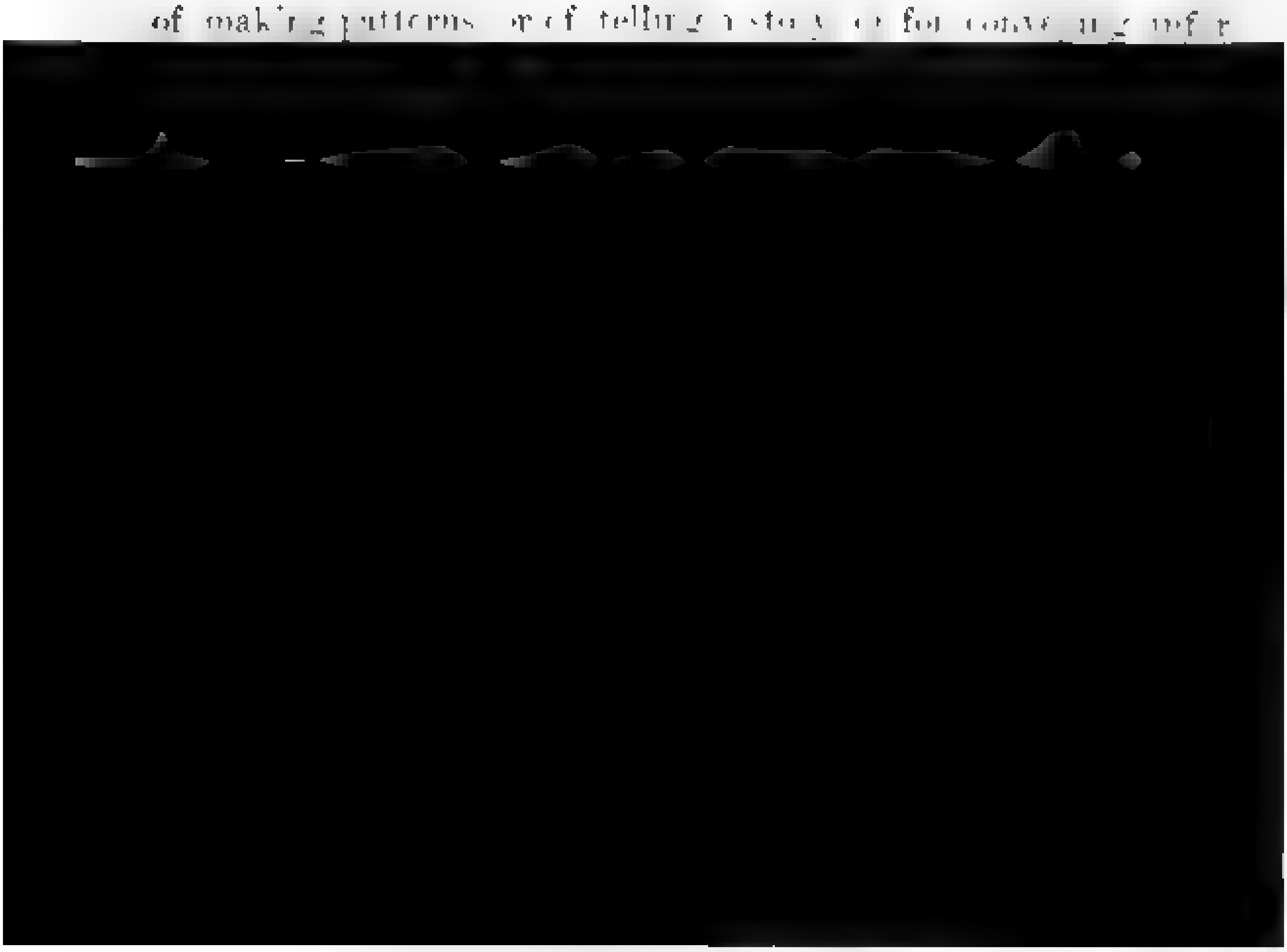
|| Among Cannibals, 1890, p. 51, f. *b*.

¶ t. 32, f. 3.

** Proc. Linn. Soc. N.S. Wales, 1894, ix (2), t. 10, f. 2.

On taking a general glance over the figures of these boomerangs one is struck with the limited number of designs that appear to have been used amongst the aboriginal artists, notwithstanding that so far as detail goes no two are precisely alike. The designs are confined to the loop, half-loop, rhomb, oval, cross, rectangular bars, and semilunate, festoon, and zig-zag patterns, with modifications of one or the other. The chevron or herring pattern is also often met with. Circles and spirals are conspicuous by their absence on boomerangs. True it is the incised work of our Aborigines is devoid of that finish and delicacy of execution seen in the carvings of many other dark races for instance, compare some of the beautiful designs employed by the Dyaks to ornament their wood work. At the same time the incised patterns of our Aborigines have a character of their own not to be mistaken for those of any other race

Whenever natural objects are represented they are always to a greater extent recognisable as such, and do not seem to be degenerate representations of a higher and more advanced art previously existing, the realism being maintained and not abandoned. Writing on the "Decorative Art of Torres Straits," Professor A. W. Haddon says* :—" We see that the animals are always represented individually, and are not utilised for the purpose of making patterns or of telling a story or for conveying infor



ON A NEW GENUS AND SPECIES OF FISHES FROM MAROUBRA BAY.

BY J. DOUGLAS OGILBY.

(Communicated by T. Whitelegge, F.R.M.S.)

It is again my pleasing duty to record yet another new fish from Maroubra Bay, where it was obtained by Mr. Whitelegge early in February. The constant recurrence of new forms of animal life in this small bay, probably the only spot on the Australian coast which has been systematically and scientifically explored, is an additional proof, if one were needed, of how imperfect a knowledge of our littoral fauna we possess.

I am puzzled to know in what family this genus should be placed; a casual glance would indicate affinity to the *Apogonidæ*, but the absence of vomerine teeth and the number of the dorsal spines apparently deny it a resting-place among these little fishes, unless indeed it should be considered to be an aberrant Apogonid with sciænoid affinities.

APOGONOPS, gen.nov.

Body elongate-oblong and somewhat tapering posteriorly, compressed. Head large. Mouth rather large, with oblique cleft, the premaxillaries protractile and forming almost the entire anterior margin of the upper jaw; maxillary exposed, without supplemental bone; lower jaw the longer. Two nostrils on each side, the anterior rather the larger and situated much nearer to the eye than to the extremity of the snout. Eye large. Preorbital entire; preopercle with a double ridge; the inner ridge entire, the outer with a few weak spines round the angle; opercle with

two spines: the membranous portion produced and pointed, extending well beyond the lower spine: posttemporal spiniferous. Gill-membranes separate from the isthmus. gills four, a slit behind the fourth; seven branchiostegals: pseudobranchiæ present: gill-rakers moderate, rather slender. Narrow bands of villiform teeth in the jaws, vomer, palatines, and tongue edentulous. A single dorsal fin, deeply notched, with x 10 rays, the spinous portion longer than the soft, anal short, with iii 7 rays, the second spine strong and laterally grooved, ventrals inserted below the base of the pectorals, close together, with a strong spine; pectorals pointed, with 14 rays, the second the longest and much stronger than the third, caudal emarginate, the peduncle long and strong. Scales moderate, cycloid, concentrically striated, very deciduous: head partially naked, soft dorsal and anal fins with a basal scaly sheath, no scaly process between the ventrals. Lateral line continuous, extending on the base of the caudal fin, the tube straight and simple, not quite reaching to the extremity of the scale.

Etymology :- Apogon; ὄψ, resemblance.

Distribution : -Coast of New South Wales.

APOGONOPS ANOMALUS, sp.nov.

the middle of the eye, its length half of that of the head; its distal extremity is expanded, two-fifths of the diameter of the eye in width, its posterior margin sinuous. The preorbital and the inner ridge of the preopercle are entirely unarmed, while the outer ridge has a few feeble spines at or near the rounded angle; lower opercular spine the longer; posttemporal with five spines. About 22 gill-rakers on the lower branch of the anterior arch. The dorsal fin originates above the base of the pectoral; the spines are rather weak; the first short, about one-third of the second and sub-equal to the eighth; the fourth spine is the longest, two-fifths of the length of the head and five-sixths of the anterior soft rays; the ninth spine is very short, and the tenth is intermediate in length between the sixth and seventh: the anal originates beneath the fourth soft ray of the dorsal; the first spine is very short and stout, the second much stronger, but not so long as the third, which is one-third of the length of the head, and not much shorter than the anterior rays: ventral not reaching to the vent, the outer ray the longest, four-sevenths of the length of the head: pectoral two-thirds of the head: caudal emarginate, the peduncle long and tapering, its depth immediately behind the dorsal fin $1\frac{3}{4}$, its least depth $2\frac{3}{5}$ in its length.

Brownish-green, the sides strongly tinged with yellow; thorax and abdomen silvery; upper surface of head bluish, the lips, interorbital region, and an angular band on the occiput darkest; opercle bluish: a series of five large olive brown spots along the side; lower side of tail with three groups of crowded brown specks; dorsal fin sparsely, caudal densely covered with similar specks, the latter with two large dark basal spots.

The single example collected measures 54 millimeters and is apparently full grown.

CATALOGUE OF THE DESCRIBED COLEOPTERA OF AUSTRALIA. SUPPLEMENT, PART II.

By George Masters.

Issued separately as a Supplement to the Part.

ON THE OCCURRENCE OF CALLOSITIES IN *CYPRÆA* OTHER THAN *CY. BICALLOSA* AND *CY. RHINOCERUS;* AND ON THE OCCURRENCE OF A SULCUS IN TRIVIA.

By Agnes F. Kenyon.

(Communicated by John Brazier, F.L.S.)

I have lately come across several specimens of different species of *Cypræa (helvola, tabescens, miliaris, erosa)*, which have the termino-dorsal arches adorned with callosities. Though these do not occur in every specimen, still finding it in several specimens of the genus, it proves that it is not an abnormal incident; and therefore I think the circumstance deserving of being recorded.

Cy. helvola (callused variety) possessing a double or twin callosity at the posterior extremity; the callus is not so well defined anteriorly, though in some specimens well marked; extremities white.

Cy. tabescens (callused var.): extremities with a callus more or less conspicuous, and in some instances furnished with two at the [redacted]

Cy. angustata (var.): I found at Flinders, Victoria, several specimens with the margins unspotted and dorsal surface uncoloured.

On the occurrence of a Sulcus in Trivia australis It is somewhat unusual to find any species of the genus *Trivia* with a dorsal impression or sulcus, as the authorities have agreed in defining them with none. I have, however, several specimens distinctly marked; also one in which the base is not white; and one which has only one spot at each end may be pronounced a Victorian variety of *T. napolini*, it having been found at Flinders, Victoria. I have also a pair of *T. napolini* from West Australia with a distinct sulcus.

It will therefore be noted that some of the distinguishing marks of this genus are absent in these specimens.

NOTES AND EXHIBITS.

Mr. Hedley called attention to specimens of ***Fiona marina***, Forskal, collected at Maroubra Bay, on February 9th, 1896, by Mr. T. Whitelegge, who first found the genus in Australia last year, the discovery being recorded in Proc. Malac. Soc. I. p. 333, footnote. The first examples found were swimming free, and were tinted that shade of dark blue common to *Ianthina*, *Glaucus*, *Porpita*, *Velella*, *Physalia* and other pelagic animals. In the present instance they were of a pearl-grey colour, and were sunk in deep grooves evidently gnawed by themselves in fragments of an indeterminate species of *Sepia* shell, upon which grew examples of *Lepas ansifera* about 10 mm. in length. With them were associated several masses of ova, resembling those figured by Bergh (Result. Camp. Scient. Prince Monaco, Fasc. iv. Pl. I. f. 16). In support of the suggestion that the coloration of these specimens was a protective adaptation to the colour of the Sepia, the molluscs, ova and cuttlebone were exhibited.

Mr. Hedley also reported that on March 8th last Mr. Whitelegge had further increased the list of Australian genera by the discovery of the specimens of *Firoloides desmaresti*, Lesueur, which were exhibited on behalf of the finder. Two males and three [redacted]

A. P. Kemp, of Kempsey. These snakes were hatched in captivity, the eggs having been obtained at Unkya, on the Macleay River. In a gully, at this place, individuals of the species were said to exist, not in scores, but in hundreds; and in view of the large number exhibited at the meeting the statement was by no means difficult of belief.

In illustration of Mr. Kenyon's paper, Mr. Brazier exhibited specimens of *Cypræa helvola*, *C. tabescens*, *C. erosa*, *C. miliaris*, *C. lynx*, and *C. carneola*, all showing callosities; a colour variety of *C. angustata;* and examples of *Trivia australis* with a distinct dorsal sulcus, a character not in conformity with the generic definition.

Mr. Turner exhibited some well grown fruits of *Pyrus domestica*, L., the True Service Tree, from a garden at Camden, a species which, it is believed, has seldom been observed to fruit here.

WEDNESDAY, APRIL 29TH, 1896.

The following Meetings of the Society were held in the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, April 29th, 1896.

ADJOURNED ANNUAL GENERAL MEETING.

The Hon. Treasurer read the report of the Auditors, who, after an examination of the books, vouchers, and securities, certified the accounts for 1895 to be correct.

On the motion of Mr. P. R. Pedley, the report was adopted.

[redacted]

MONTHLY MEETING.

The President gave notice that upon requisition he convened a Special General Meeting to be held on May 27th, to take precedence of the Monthly Meeting. *Business:* Professor Haswell to introduce the subject of the establishment of a Biological Station on the Society's grounds at Elizabeth Bay.

DONATIONS.

Zoologischer Anzeiger. Bd. xix. Nos. 496-498 (Feb.-March, 1896). *From the Editor.*

K. K. Zoologisch-botanische Gesellschaft in Wien—Verhandlungen. Jahrgang 1896. xlvi. Bd. 1 Heft. *From the Society.*

Société Hollandaise des Sciences à Harlem—Archives Néerlandaises. T. xxix. 4me et 5me Livs. *From the Society.*

Muséum d'Histoire Naturelle, Paris—Bulletin. Année 1895. Nos. 1 and 8. *From the Museum.*

Société Scientifique du Chili — Actes. T. iv. (1894) 5me Livraison. *From the Society.*

Field Columbian Museum—Historical Series. Vol. i. No 2 (May, 1895): Geological Series. Vol. i. No. 1 (Aug. 1895): Botanical Series. Vol. i. No. 1 (Aug. 1895). *From the Director.*

American Philosophical Society—Proceedings. Vol. xxxiv. No. 147 (Jan. 1895). *From the Society.*

Portland Society of Natural History—Proceedings. Vol. ii. 1895. Part 3: The Portland Catalogue of Maine Plants. Second Edition. *From the Society.*

Academy of Science of St. Louis—Transactions. Vol. vi. No. 18: Vol. vii. Nos. 1-3 (Jan.-Feb., 1895). *From the Academy.*

U. S. Geological Survey—Bulletin. Nos. 118-122 (1894): Monographs. Vols. xxiii. and xxiv. (1894): Fourteenth Annual Report (1892-93). Parts i. and ii. *From the Director.*

Smithsonian Institution—Report of the U.S. National Museum, 1893. *From the Institution.*

Seven Pamphlets by Prof. J. F. James. (From the Journal of the Cincinnati Society of Natural History; July, 1884-July, 1894). *From the Author.*

American Museum of Natural History—Memoirs. Vol. i. Part ii. (Aug. 1895): Bulletin. Vol. viii. (1896), Sig. 1, pp. 1-16 (March). *From the Museum.*

Naturhistorisches Museum in Hamburg—Mitteilungen. xii. Jahrg. (1894). *From the Museum.*

Gesellschaft für Erdkunde zu Berlin—Verhandlungen. Bd. xxii. (1895), Nos. 4-6: Zeitschrift. Bd. xxx. (1895), Nos. 2-3 *From the Society.*

Pamphlet entitled "Geogenetische Beiträge." By Dr. Otto Kuntze. *From the Author.*

K. K. Naturhistorisches Hof-Museum in Wien—Annalen. Bd. x. (1895), Nr. 1. *From the Museum.*

Société Impériale des Naturalistes de Moscou—Bulletin. Année 1895. No. 3. *From the Society.*

Perak Government Gazette. Vol. ix. Nos. 4-6 (Feb.-Mar., 1896). *From the Government Secretary.*

Bureau of Agriculture, Perth, W.A.—Journal. Vol. iii. No. 6 (Mar. 1896). *From the Secretary.*

Pharmaceutical Journal of Australasia. Vol. ix. No. 3 (Mar. 1896). *From the Editor.*

Société d'Horticulture du Doubs, Besançon—Bulletin. Série Illustrée. No. 2. (Feb., 1896). *From the Society.*

Zoological Society of London—Abstracts, 18th Febry., March 3rd (and Rules for the Scientific Naming of Animals, &c.), and March 17th. *From the Society.*

Royal Society, London—Proceedings. Vol. lix. No. 354 (Feb., 1896). *From the Society.*

L'Académie Royale des Sciences et des Lettres de Danemark, Copenhague—Bulletin. Année 1895, Nos. 3-4: 1896, No. 1. *From the Academy.*

Marine Biological Association of the United Kingdom—Journal. N.S. Vol. iv. No. 2 (Feb., 1896). *From the Association.*

Royal Microscopical Society—Journal, 1896. Part 1 (Feb.). *From the Society.*

Societas Entomologica Rossica—Horæ. T. xxix. (1894-95). *From the Society.*

Seven Conchological Pamphlets. By Edgar A. Smith, F.Z.S., &c. *From the Author.*

"The Wealth and Progress of New South Wales, 1894." *From the Government Statistician.*

Department of Public Instruction, Sydney—Technical Education Series, No. 11—"Gems and Precious Stones." By H. G. Smith, F.C.S. *From the Curator, Technological Museum.*

Royal Society of Queensland—Proceedings. Vol. xi. Part 2 (1896). *From the Society.*

Naturwissenschaftlicher Verein in Hamburg—Abhandlungen. xiv. Band (1896): Verhandlungen, 1895 (Dritte Folge, iii.). *From the Society.*

Société des Sciences de Finlande—Observations Météorologiques faites à Helsingfors en 1894. Vol. xiii. 1re Liv. *From the Society.*

Société Royale Linnéenne de Bruxelles—Bulletin. 21me Année. Nos. 4-5 (Feb.-March, 1896). *From the Society.*

Museo di Zoologia ed Anatomia comparata della R. Università di Torino—Bollettino. Vol. x. (1895), Nos. 210-220; Titlepage, &c.: Vol. xi. (1896), Nos. 221-226 (Jan.-Feb.). *From the Museum.*

Royal Physical Society of Edinburgh—Proceedings, Session 1894-95. Vol. xiii. *From the Society.*

Australasian Journal of Pharmacy. Vol. xi. No. 124 (April, [redacted]

Department of Agriculture, Sydney—Agricultural Gazette. Title Page and Index to Vol. vi. (Jan.-Dec., 1895): Vol. vii. Part 3 (Mar., 1896). *From the Hon. the Minister for Mines and Agriculture.*

Pamphlet entitled "Remarks on the Past, Present, and Future of the Australian Flora." By the Rev. W. Woolls, Ph.D., F.L.S. *From Mrs. Woolls.*

Archiv für Naturgeschichte lviii. Jahrgang (1892). ii. Bd. 3 Heft: lxi. Jahrg. (1895). i. Bd. 3 Heft. *From the Editor.*

Auckland Institute and Museum—Annual Report for 1895-96. *From the Institute.*

Woods and Forests Department, Adelaide, S.A.—Fourteen Annual Progress Reports (1881-95). *From the Conservator of Forests, Adelaide.*

Victorian Naturalist. Vol. xii. No. 12 (March, 1896). *From the Field Naturalists' Club of Victoria.*

THEORETICAL EXPLANATIONS OF THE DISTRIBUTION OF SOUTHERN FAUNAS.

BY CAPTAIN F. W. HUTTON, F.R.S., HON. MEMB. L.S.N.S.W.

On considering the present geographical distribution of land and purely fresh-water vertebrates the first and most obvious generalisation is that while the same or closely allied species are widely spread in the northern hemisphere—through Europe, Asia, and N. America—there is, in the southern hemisphere, a great difference between those inhabiting S. Africa, Australasia, and S. America. When we turn our attention to the marine vertebrates—including the migratory fishes which pass a part of the year in fresh water—we notice that the opposite is the case; for while closely related species are widely diffused in the southern hemisphere, the seals, whales, sea-birds and fishes of the N. Pacific differ considerably from those of the N. Atlantic. The reason for these peculiarities is, of course, the peculiar configuration of the land and sea, giving most of the land to the northern and most of the sea to the southern hemisphere; and a necessary conclusion is that the present configuration of the oceans and [redacted]

hemisphere which do not bear out the conclusion forced upon us by the majority of the facts, and the question arises: Have these relationships been brought about by the former existence of more land in the southern hemisphere, or can they be explained without any such assumption?

The first discussion of the question was by Sir Joseph Hooker, who, in 1853,* advocated a "larger and more continuous tract of land than now exists" in the Antarctic Ocean to explain the distribution of the flowering plants of the Southern Islands. He assigned no date to this extension of land, but, no doubt, supposed it to be not very ancient.

In 1870, Professor Huxley, in his Anniversary Address to the Geological Society of London, said that the simplest and most rational mode of accounting for the differences between the mammalian faunas of Australia, S. America, and Arctogæa, as well as for the sudden appearance of Eutheria in the latter and in S. America, is the supposition that a Pacific continent existed in the Mesozoic era which gradually subsided, Australia being separated at the end of the Triassic period before the higher mammalia had come into existence. These Eutheria subsequently migrated into North and South America when the Pacific continent finally sank. He says: "The Mesozoic continent must, I conceive, have lain to the east, about the shores of the N. Pacific and Indian Oceans, and I am inclined to believe that it continued along the eastern side of the Pacific area to what is now the province of Austro-Columbia, the characteristic fauna of which is probably a remnant of the population of the latter part of this period."†

In 1873 I proposed the following hypothesis to explain the complicated problem of the origin of the New Zealand fauna. An Antarctic Mesozoic continent which subsided in the upper Cretaceous period. During the Lower Eocene a second extension of land from New Zealand northwards so as to include New

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* Flora Novæ Zealandiæ, Introduction, p. xxi.

† Quart. Journ. Geol. Soc. Vol. xxvi. p. lxiii.

Caledonia and part of Polynesia. Subsidence in the Oligocene and Miocene, followed by a third elevation in the Older Pliocene when New Zealand was connected with the Chatham Is., Auckland Is., and perhaps others to the south, but did not stretch north into Polynesia. This large island was broken up by subsidence during the Newer Pliocene.*

In 1874 Prof. A. Milne-Edwards presented to the Academy of Sciences, Paris, a report on the fossil birds of the Mascarene Islands showing that they were related to those of New Zealand. As an explanation, he supposed that land communication had formerly existed between these islands and New Zealand, which was also joined to some islands in Polynesia, while it remained separated from Australia. The connection with Polynesia was to explain the occurrence of *Rhinochetus* in New Caledonia and *Didunculus* in Samoa.

In 1876 Prof. H. N. Moseley supported Sir Jos. Hooker's theory of a former greater extension of land in the Antarctic Ocean†; and in the same year Mr. A. R. Wallace published his "Geographical Distribution of Animals," which treats of the whole question.

In 1880 Mr. Wallace published "Island Life," in which he proposes the following hypothesis relating to Australia and New Zealand. During the Cretaceous period, and probably throughout

[redacted]

it extended northward to the Kermadecs and even to Tonga and Fiji. Whether it also extended to the Chatham Islands and Macquarie Island we have, he says, no means of ascertaining, but such is possible. Separation of New Zealand from Australia took place at the close of the Cretaceous period, or in the early Tertiary. At a somewhat later date a southern extension of New Zealand towards the Antarctic continent seems probable "as affording an easy passage for the numerous species of South American and Antarctic plants, and also for the identical and closely allied fresh-water fishes of these countries."*

In 1882 M. Emile Blanchard contributed a paper to the Academy of Sciences, Paris, called "Proofs of the subsidence of a Southern Continent during recent Geological Epochs."†

In 1884-5 I made a further contribution to the subject,‡ in which I abandoned my former idea of a Mesozoic Antarctic Continent, and substituted for it a Mesozoic Pacific Continent, stretching, more or less completely, from Melanesia to Chili. I still adhered to the other portions of my former paper, but laid more stress than before on a greater extension of Antarctic islands during the Older Pliocene.

In 1888 Dr Theodore Gill published, in the Memoirs of the National Academy of Sciences, Philadelphia, a paper called "A comparison of Antipodal Faunas," in which he also advocated the existence of "some terrestrial passage way" between Tasmania, New Zealand, and South America, "at a time as late as the close of the Mesozoic period. The evidence of such a connection afforded by congeneric fishes is fortified by analogous representatives among insects, molluscs, and even amphibians. The

* Island Life, p. 455.

† See N. Z. Journal of Science, Vol. i., p. 251. In the same Journal will be found a paper by Dr. H. Filhol on the Geological and Zoological Relations of Campbell Island with the neighbouring Islands.

‡ Part I. in N. Z. Journ. Sci., Vol. ii. p. 1, and A. M. N. H. (5), xiii., 425. Part II. in N. Z. Journ. Sci., Vol. ii. p. 249, and A. M. N. H. (5), xv., 77.

separation of the several areas must, however, have occurred little later than the early Tertiary, inasmuch as the salt-water fishes of corresponding isotherms found along the coasts of the now widely separated lands, are to such a large extent specifically different."

In 1892 Dr. H. von Jhering published a paper in the Trans. N. Z. Inst. Vol. xxiv. "On the Ancient Relations between New Zealand and South America." He here supposes that during the whole of the Mesozoic era a continent—which he calls Archiplata—existed which included Chili and Patagonia and extended into the South Pacific. This gradually subsided, throwing off first the Polynesian Islands, then New Zealand, and finally New Guinea and Australia. All this took place before and during the Eocene period; after which Archiplata was joined to Archiguyana, which occupied the high lands of Brazil and Venezuela. Dr. F. Ameghino has also, quite independently, advocated a Pacific Mesozoic continent to explain the relations of the Eocene marsupials of Patagonia to those of Australia, and Prof. Zittel has expressed a favourable opinion of this theory.*

In 1893 Dr. H. O. Forbes published a paper in the "Geographical Journal (Supplementary Papers") called "The Chatham Islands: their relation to a former southern continent," in which [redacted]

and early Tertiary times of a strip of land extending from S America across the pole to Tasmania; New Zealand, in Tertiary times, reaching near this antarctic land without joining it. And in "Natural Science" he had a paper "On the Relations of the Fauna and Flora of Australia to those of New Zealand, in which he supports the idea of an ancient continent, or "Melanesian Plateau,* which included the Solomon Islands, Fiji, New Hebrides, New Caledonia, Lord Howe Island and New Zealand, but was separated from Australia and New Guinea. No date is given to this island-continent, but it is supposed to be later than the "Australian Tertiary and Mesozoic beds", later, therefore, than the Antarctic land.

In 1895, Mr Hedley returned to the subject in a paper to the Royal Society of N S W called "Considerations on the surviving Refugees in Austral Lands of ancient Antarctic Life. Here he advocates an Antarctic continent, which was a very unstable area, "at one time dissolving into an archipelago, at another resolving itself into a continent" He thinks that snakes, frogs, monotremes and marsupials passed across this continent, from S America to Tasmania, during a warm, Mid tertiary period He also now thinks that the southward extension of New Zealand, mentioned in his former paper, was synchronous with its northern extension to the Melanesian plateau, that is, it was late instead of early Tertiary date

This short historical sketch will, I think, make it clear that a considerable amount of ingenuity has been expended in trying to solve the interesting problem of the distribution of southern faunas The differences of opinion are due partly to some of the authors having taken only a small number of the known facts into consideration, and partly to constant additions to our knowledge either by the discovery of new facts, or by the correction of old errors. No doubt our knowledge will still increase, but it seems hardly possible to make any more theories. The problem is a very intricate one, and we may be sure that the true solution is not simple.

* Called Antipodea by Dr. Forbes

It is evident that in any large district, like Australasia, there is no reason to suppose that the ancestors of the animals and plants now inhabiting it all came from the same direction or at the same time : consequently the first step to take is to try to separate the fauna and flora into groups which find their nearest relations in different directions. Thus in Australasia we have—

1. An Australasian fauna and flora which have no near relatives now living.

2. A northern fauna and flora related to the Oriental fauna and flora of the present day.

3. A south-tropical or sub-tropical fauna and flora whose nearest relations at present are either in S. Africa or in S. America north of 40° S. That the differences between these countries are far greater than their resemblances does not do away with the existence of these resemblances, but rather accentuates them. They are vestigial remains with all the importance that vestigial remains always possess.

4. A south-temperate or cold-temperate fauna and flora, with relations to plants and animals in Patagonia or Chili and the Antarctic Islands. This is usually called the Antarctic element.

Judging by the relative closeness of the relationship of these different faunistic elements to their foreign connections, we must

America and Australasia, for in that case there would have been a far greater commingling of the land faunas and floras. It is the origin of the first and third elements which has given rise to such differences of opinion. These are developed far more strongly in Australia and Tasmania than in New Zealand, and the explanation of the third will probably explain the first also. I will, therefore, briefly review the three hypotheses (variously modified) which have been proposed.

1. The first explanation is that the different groups of animals and plants in question have migrated from the northern hemisphere into the southern by the present continents and have since then become extinct in the north. With regard to the South African connection, this explanation will be readily accepted. The fact that Proteaceous plants (now almost confined to S. Africa and Australia) were formerly abundant in Arctogæa is a proof, so far as they are concerned, and we may accept the same explanation for the occurrence of the Baobab-tree (*Adansonia*) in W. Australia and the Fern-bird (*Sphenœacus*) in New Zealand. This theory also explains the occurrence of the curious genus of wingless locusts (*[illegible]*) in Madagascar and Australia and the connection of some birds of Madagascar and the Mascarene Islands with others of New Zealand and Polynesia. It will also explain the abundance of parrots in Australia and S. America, for these lived in Europe in the Miocene period, as well as the occurrence of tapirs and trogons in Central America and Malaya; for these, like the large carnivora, must have passed from one continent to the other by a northerly passage. Probably also it will explain the relation of the curassows of S. America to the megapodes of Australia and Polynesia, and the connection between the lower passerine birds of both continents, as these relationships are all very distant.

But, however this may be, there are certain facts of distribution which this theory cannot solve. A typical case is the distribution of the tree-frogs belonging to the genus *Hyla*. This contains [illegible] species in S. America, 28 in Australia, 17 in N. America, and one each in India, China, and Europe; while *Hylella* is found

only in Australia and tropical America. Again the fresh-water tortoises belonging to the family *Chelydidæ* are restricted to Australia and S. America. The fresh water fish *Osteoglossum* is represented by species in S. America, Queensland, and Borneo; and the South American beetles are more closely related to those of Australia and Africa than they are to those of N. America. Indeed the connection between S. America and Australia is so marked in the *Buprestidæ* and *Longicornia* that Mr. Wallace, who as a general rule strongly supports the northern route, says that "there must probably once have been some means of communication between the two regions better adapted to these insects than any they now possess." And as several of the Eocene mammalia of Patagonia were closely allied to those now living in Australia the evidence for a former land passage between the two countries may be considered as conclusive. The northern route therefore fails to give a full and satisfactory account of the whole of the facts, and we must look to some other route to supplement it. The portions of the faunas unaccounted for are all old forms of life, and consequently we must conclude that the means of communication used by them has been long ago destroyed; for if not it would also have been used for modern groups.

2. Turning now to the proposed southern route by an Antarctic continent, it has this in its favour that, as the greater extension

think that the climatic objection is fatal, for we cannot tell what the climate may have been in the Jurassic and Cretaceous periods, but it is a difficulty, and I cannot go so far as Mr Hedley, who supposes that venomous snakes, frogs, monotremes and marsupials passed round the head of a deep bight of the Pacific Ocean which "stretched within a few degrees of the pole."

A far greater difficulty remains for consideration, which is this: Aplacental Mammals – both Multituberculata and Polyprotodontia – existed in Europe and N. America in the Triassic and Jurassic periods, and these Polyprotodontia were, no doubt, the ancestors of the living Polyprotodontia of Australia. In the Eocene strata of Patagonia remains of a large number of Polyprotodontia have been found which are far more closely related to the Polyprotodontia of Australia than to the Mesozoic forms of Europe and N. America, consequently a direct land communication must have existed between these two southern countries. Now there is strong geological and palæontological evidence that no land ridge existed between N. and S. America during the Mesozoic and early Cainozoic eras, consequently we must assume that the southern forms migrated through the Malay Archipelago, and, if they went to Patagonia by means of an Antarctic continent, they must have passed through Australia. But mingled with the Eocene marsupials of Patagonia there are a number of Eutheria of typically South American character – *Edentata*, *Toxodontia*, *Typotheria*, *Perissodactyla*, *Rodentia*, and even *Platyrhine* monkeys – without any northern forms of *Artiodactyla*, *Carnivora*, or *Insectivora*, and it is hardly possible that these should have passed through Australia without leaving any record behind. This is, to me, a fatal objection to the theory of migration by means of an Antarctic continent.

3. The theory of the former existence of a South Pacific Mesozoic continent seems to be the only theory left, but it has been objected to both on account of the present depth of the ocean and because, it is said, no record has been left in the Polynesian Islands of the supposed passage of the plants and animals. Both these objections apply equally to the former

existence of an Antarctic continent. According to the latest maps the ocean south of Tasmania, and the Pacific below 45° S., are considerably deeper than the Pacific between 10° and 30° S., and the answer in both cases is that this continent existed a very long time ago. The answer to the second objection is that no record has been preserved of the fauna and flora on the Antarctic continent because of a change in climate, and in the Polynesian Islands because the continent disappeared entirely below the sea, the present volcanic and coral islands being merely outgrowths on its submerged back. But the statement that no record exists in the case of the Pacific continent is not quite correct, for the Iguanas of Fiji can hardly be explained in any other way.

The theory of a Mesozoic South Pacific continent not only explains the origin of the Australian and S. American marsupials, but also the almost simultaneous appearance of different Eutherian mammals in North and South America. We must suppose that this continent threw off first New Zealand, then Australia, then Chili, and finally disappeared under the waves. The reasons why we must suppose New Zealand to have been at one time attached to the continent are the existence in that country of *Sphenodon*, *Unio*, and *Astacidæ*, none of which are found in truly Oceanic islands*. At a later date, as I pointed out in my former papers, New Zealand must have formed part of a large island

of continental and oceanic areas negatives it. This doctrine—which is not accepted by all geologists*—is founded on the undoubted fact that the principal mountain ranges in the northern hemisphere, and, perhaps, in Australia also, are formed of shallow water sediments representing all periods from the Silurian upwards; consequently land must have existed in their neighbourhood all that time; and from this it is inferred that the present oceanic areas have always been sea. The proof, however, is far from being complete, and no explanation has, as yet, been given either (1) of the remarkable submarine plateaux found in the basins of the S. Pacific and S. Atlantic Oceans; or (2) of the sudden irruption of mollusca, bony-fishes and dicotyledons into N. America during the close of the Cretaceous period, followed by a host of Eutherian mammalia in the Eocene; or (3) of the place of origin of the peculiar S. American mammalia. The former existence of a Mesozoic Pacific continent seems to me, as it did to Professor Huxley, the simplest explanation of all these difficulties; we can never expect to attain certainty in the matter, but I think that the weight of the evidence is in its favour.

* Gardner, Geol. Mag. 1882, p. 546; Hutton, N.Z. Journal of Science, Vol. I. p. 406 (1883); Blandford, Q.J.G.S. XLVI. Proceedings, p. 59 (1890); Oldham, Geol. of India, 2nd Ed. p. 211 (1893).

REPORT ON A BONE BRECCIA DEPOSIT NEAR THE WOMBEYAN CAVES, N.S.W.:

WITH DESCRIPTIONS OF SOME NEW SPECIES OF MARSUPIALS.

By R. Broom, M.D., B.Sc.

(Plates vi.-viii.)

About 18 months ago I discovered a small bone breccia deposit in the neighbourhood of the Wombeyan Caves. The deposit is situated in a small depression near the top of the hill above the present caves and no doubt is portion of the floor of an older cave whose walls and roof have long since been weathered away. The deposit consists of a rather hard light brown calcareous matrix containing imbedded in it innumerable small bones. In some parts the bones are almost all small and packed together so closely that there is very little matrix; in others the matrix is comparatively free from bones, only containing a few of the larger forms. As the deposit is unquestionably old and contains some forms new to science—two of which I have already described*—I have thought it well to give a detailed account of the forms found, as it will give a fair idea of the smaller animals living in

about that of *Macropus ualabatus*, but the dental details are decidedly different. Of existing species the only one to which it comes at all close is *M. agilis*, but from this species it differs in the narrowness of the molars and in the jaw being considerably thinner. Among extinct forms the only ones approaching it in dental details and measurements are some fragmentary specimens from Queensland, referred to by De Vis.* Thinking my form might possibly belong to the same species as one or other of the fragmentary Queensland specimens, I submitted a specimen to Mr. De Vis, who kindly writes me as follows:—"I have compared the Halmaturus jaw with my types: it agrees with none of them. In size and general features it is like *H. agilis*, but appears to me to be quite distinct from that species." As my specimens thus appear to differ from all existing or previously observed extinct species, I have conferred on it the above distinctive name from the locality in which the form has first been observed.

In general form the lower jaw resembles that of the larger Wallabies; there is, however, a greater disparity between the anterior and posterior depth of the jaw than is usually the case in existing forms. The dental portion of the jaw is comparatively narrow—more so than in any of the existing larger Wallabies. The angle is more inflected than in the Wallabies, closely resembling the condition in the Rock-Wallabies. The premolar (p^4) is well developed, rather narrow without internal cusp. It is slightly ridged, there being three very shallow vertical grooves. In the specimen figured (Pl. vi. fig. 3) there are also on the outer aspect two small horizontal furrows. The molars resemble very closely those of *M. ualabatus*—the crests being curved and the links well developed.

Though two specimens illustrate the palatal region, in neither are the teeth well preserved. The upper premolar (p^4), however, appears to have had a moderate internal cusp. One point of great interest is the presence of large palatal vacuities. In this

* Proc. Linn. Soc. N.S.W. (2) Vol. x. (Pt. i. 1895).

the form agrees with the smaller Wallabies and Rock-Wallabies and differs from the larger sorts.

Though the form thus equals in size the larger Wallabies, its affinities are probably more with the smaller sorts, and in some respects it seems to come very near to the Rock-Wallabies (*Petrogale*).

The following are some of the principal measurements :—

Depth of mandibles behind p^4 (4 sp.), 17, 18, 18·4, 18·4 mm.
„ „ in front of m^4 (3 sp.), 15·4, 16·9, 16·9 mm.
Length of p^4 (2 sp.)... 6·8 mm. (worn), 7·4 mm. (unworn).
„ m^1-m^2 (2 sp.)...13·4, 13·5 mm.
„ m^1-m^3 (2 sp.)...21·8, 21·9 mm.
„ m^2-m^4 (2 sp.)...25, 26 mm.
„ m^1-m^4 (3 sp.)...29·2, 30·8, 31·4 mm.
„ m^3-m^4 (3 sp.)...17·8, 18·, 18·8 mm.
„ p^4-m^4 (3 sp)...36·5, 37, 37·4 mm.
Width of m^3 (3 sp.)...5·7, 5·8, 5·8 mm.
Thickness of mandible below m^3, 9·3 mm.

Potorous tridactylus, var. antiquus, n.var.

In the deposit are the remains of a small Potorous. Though not abundant a number of specimens have been obtained. As I have been unable to obtain a skull of the existing *Potorous* [redacted]

Dental Measurements.

Length of	upper	p^4	...6·1 mm.
„	„	dp^4	...3·4 mm.
„	„	m^1	...4·8 mm.
„	„	m^2	...4·9 mm.
„	lower	p^4	...5· mm.

BURRAMYS PARVUS, Broom.

(Pl. VII. figs. 1-2).

This most interesting little form which I recently described before this Society * occurs in the deposit pretty abundantly, but from its minute size and the obliquity of the large premolar it is difficult to extract perfect specimens. Since I described the form I have succeeded in discovering a few more points in its structure. In my paper on this species I expressed the opinion that it forms a connecting link between the Phalangers and the Kangaroos, finding in the large grooved premolars a relationship with the Rat-Kangaroos and in the entire masseteric fossa, and the small teeth between i^1 and p^4 an affinity with the Phalangers. No perfect specimen has yet been discovered of the upper jaw, but a few fragmentary specimens enable us to almost complete the dental formula. Within the upper large premolar and a little in front is a minute two-rooted premolar similar to p^3 in the lower jaw. In front of this is a very considerable diastema where the palate has a rounded edge somewhat like that in Macropus, and with apparently no anterior premolars. In front is a small but well formed canine implanted in the maxillary more after the manner of the small Macropods than of the Phalangers. The dental formula so far as known would thus appear to be, in the notation used by Thomas:—

$$I\ \frac{.\ .\ .}{1\ 2\ 0}\quad C\ \frac{1}{0}\quad P\ \frac{0\ 0\ 3\ 4}{1\ 0\ 3\ 4}\ .\ M\ \frac{1\ 2\ 3\ 0}{1\ 2\ 3\ 4}$$

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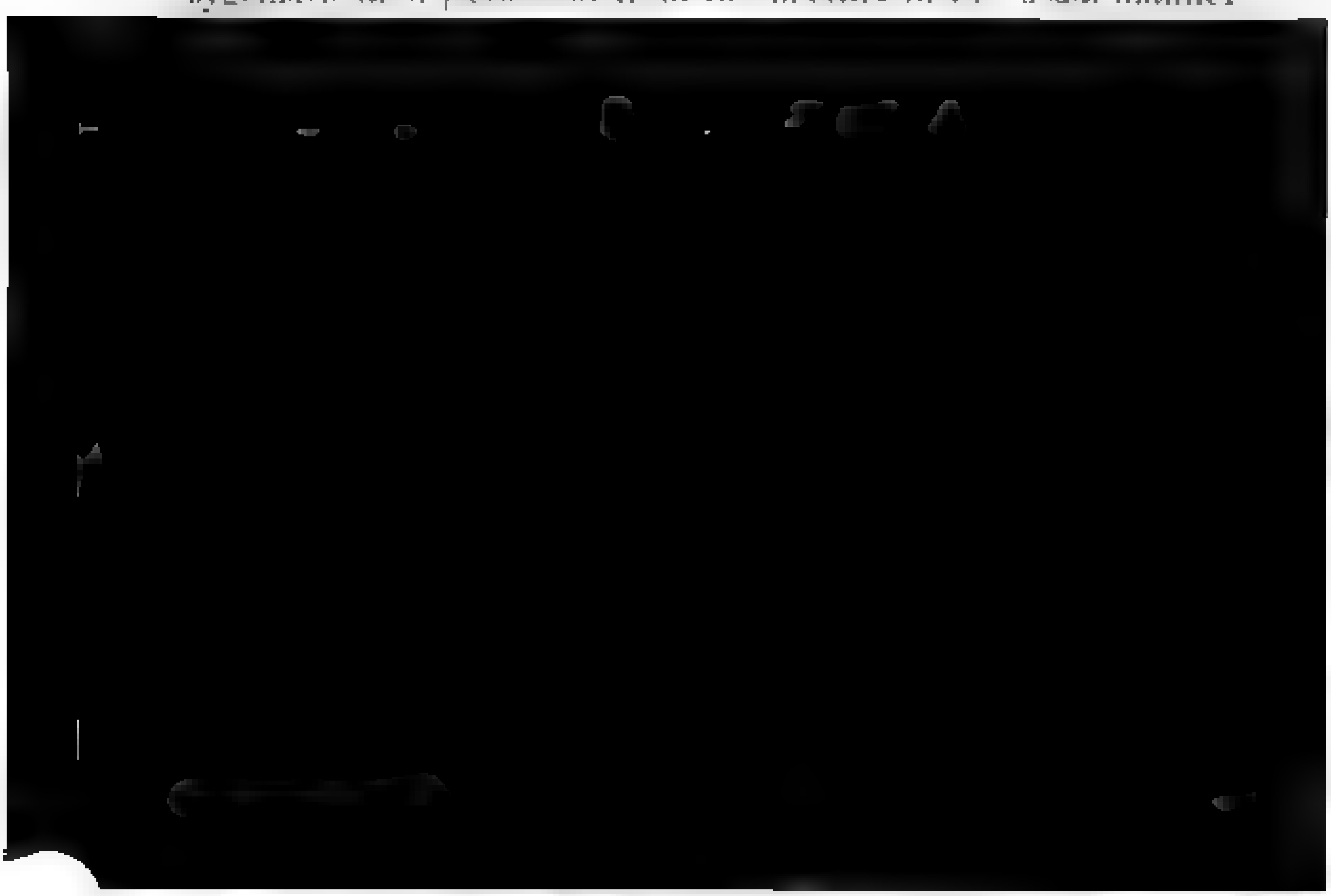
* "On a small fossil Marsupial with large grooved premolars." Proc. Linn. Soc. N.S.W. (2) Vol. x. (Pt. 4, 1895).

There appears to be no upper m^4, while the rudimentary lower m^4 is apparently variable. The dental formula shows much resemblance to that of *Hypsiprymnodon* as regards the upper teeth, but in the possession of the two small teeth between i^1 and p^3 there is considerable difference in the lower jaw. As regards the number and arrangement of the teeth in the lower jaw the agreement with some of the smaller Phalangers is very marked; *Dromicia nana*, for example, having an entire dental formula almost exactly like that of *Burramys*. To *Dromicia nana* there is also a marked resemblance in the lower minute teeth and some resemblance in the molars.

A considerable fragment of the skull gives a fair idea of the outline, but adds little to the settlement of the affinities of the genus. The skull has been apparently sharp-snouted as in *Petaurus* or *Dromicia*. The lacrymal foramen is placed distinctly in front of and beyond the orbit. The infraorbital foramen is large, and placed in front of the large premolar in this resembling the condition in the Phalangers and differing from the normal Macropod arrangement. The interorbital region of the skull is comparatively broad, but there is no distinct supraorbital ridge. The olfactory lobes of the brain have been well developed, and the whole brain appears to have been relatively large. The zygomatic arch passes out from the maxilla in the usual manner



As these are the only remains found the species must have been very rare in the district at the time of the deposit.

At present the species is found in the district and may be regarded as not infrequent, though I am led to believe that 50 years ago it was very abundant, the present scarcity being due apparently to the havoc made amongst them by domestic cats.

PALÆOPETAURUS ELEGANS, Broom.

(Pl. VII. fig. 3).

This small Petaurus-like Marsupial I recently described* from some jaws and a well preserved specimen with the maxillary teeth. Since then I have found besides numerous jaws a moderately good portion of the skull (Plate , fig. 3) and a number of other fragments. The frontal bones differ from those of *Petaurus*, and agree apparently with *Gymnobelideus* in being without supraorbital ridges; and the hinder part of the frontals is considerably broader and flatter proportionally than in *Petaurus*. The snout though narrow appears somewhat broader than in *Gymnobelideus* judging by the figure. In one of the type specimens the upper p^1 was found to be single-rooted, or rather its two roots were united together. This, too, appears to be rather variable as in two other specimens one is found with the roots close together but distinct, while the other has the roots somewhat apart. In all the observed specimens, however, p^3 is double rooted.

DROMICIA NANA, Desm.

One of the most interesting discoveries is that of *Dromicia nana*, of which I have found a large number of both lower and upper jaws. There can thus be little doubt but that in later Tertiary times *Dromicia nana* was very common in New South

* "On a small fossil Petaurus-like Marsupial," Proc. Linn. Soc. N.S.W. (2) Vol. x. (Pt. 4, 1895).

Wales. From the existing species being believed to be confined to New Guinea, Tasmania, and West Australia, Thomas regards it as practically certain that *Dromicia* existed in former times in Eastern Australia. The correctness of this conclusion is now established. The fossil form so far as known does not differ from the existing *D. nana*.

As regards the present distribution of this species Thomas considers it to be exclusively confined to Tasmania. In this, however, it is probable that he is in error. For though the species must be excessively rare in New South Wales it most probably still survives, as it is quite certain that it existed within very recent years. In the Grand Arch at the Wombeyan Caves there are near the entrance numerous ledges of rock frequented by Rock Wallabies, and on which the animals leave quantities of their excrement. Mingled with the dry and decomposing dung are to be found quantities of small bones—chiefly those of *Phascologale flavipes*, *Petaurus breviceps*, and of the Bush Rat (*Mus* sp.), but with also a few of *Pseudochirus peregrinus*, *Perameles obesula*, and of small birds and snakes. While searching among these I discovered, to my surprise, two jaws of *Dromicia nana* in tolerably good preservation. It is hard to say what may be the age of the bones, but as the ledge is quite exposed to atmospheric influences and as the bones show little sign of weathering, it cannot well be

PSEUDOCHIRUS ANTIQUUS n.sp.

(Pl. VII. Figs. 4-6).

One of the commonest forms whose remains are found in the deposit is a species of *Pseudochirus*. In size and structure it much resembles the common ring-tailed Phalanger (*P. peregrinus*), but the careful study of a large series of specimens has satisfied me that the remains are those of a distinct and new species. In average size the teeth are appreciably larger than in *P. peregrinus*, yet on the whole the form comes nearer to that species than to either *P. cooki* or *P. orientalis*.

The following table illustrates the features so far as known and the points distinguishing the fossil form from *P. peregrinus*.

P. peregrinus.	*P. antiquus.*
Upper p^1 small, about 1 mm. in front of p^3	Upper p^1 moderate size, placed close to p^3
Length of m^1-m^3 — 11·2-12·6 mm.	m^1-m^3 in only three specimens, showing complete series— 12.7, 12·9, and 13· mm.
Cusps of upper and lower molars moderately developed	Cusps of upper and lower molars well developed
Post. Ext. Cusp of upper m^1 (4 sp.) min. 1·7, max. 2·0, average 1·85	Post. Ext. Cusp of upper m^1 (5 sp.) min. 2·1, max. 2·3, average 2·22
Ant. Int. Cusp of lower m^4 (3 sp.) min 1·6, max. 1·8, average 1·7	Ant. Int. Cusp of lower m^4 (3 sp.) min. 2·3, max. 2·5, average 2·4
Palate with a distinct lateral depression in region of p^3 and p^4	Palate moderately flat, no distinct lateral depression in region of p^3 and p^4
Angle of jaw produced well backwards.	Angle of jaw relatively small and passing backwards but a short distance

It is unfortunate that I have not succeeded in getting any specimens with the upper p^1 in position, and only one specimen (Pl. fig. 4) showing the socket. From this specimen the tooth appears to have been almost double-rooted and placed much closer to p^3 than in *P. peregrinus*, and in this resembling more *P. cooki*.

PERAMELES WOMBEYENSIS, n.sp.

(Pl. VIII. figs. 1-8).

The above name I propose for a species of *Perameles* which must have been very common at the period when the bone deposit was formed. Though from the nature of the matrix I have been unable to develop a single perfect jaw, yet I have succeeded in finding sufficient fragmentary specimens to enable me to give almost all the important details of dentition. The species seems to have been a form a little larger than *P. obesula*, and to have resembled it in being short-nosed.

The upper incisor teeth are unknown, the premaxillary being absent from all the upper jaw specimens I have. The canine is moderately developed and rather larger and flatter than in *P. obesula*. P^1 is considerably larger than in *P. obesula*, and directed somewhat forward. It is placed about 2 mm. behind the canine. P^3 is about equal in size to p^1 and placed a little less than 1 mm. from

[redacted]

3 the anterior part of the jaw is seen. The canine appears to be small, though as the specimen figured (Pl. VIII. fig. 3) is from a young animal, the canine has probably not attained its full size. P^1 and p^3 resemble the upper teeth in size, and are both furnished with small anterior and posterior secondary cusps. P^4 is relatively large. Lower molars resemble those of *P. obesula*.

The following are some of the principal measurements :—

Height of canine	3·1 mm.
Length of p^1	2·8 mm.
„ unworn m^1	4·0 mm.
„ worn m^2	3·6 mm.
„ worn m^3	3·4 mm.
Estimated length of unworn m^1-m^3 ...	11·3 mm.
Lower p^3-m^4, aged specimen	21·3 mm.
Estimated upper c-m^4	28-28·5 mm.

THYLACINUS CYNOCEPHALUS, Harris.

Of this species I have found two teeth—a perfect lower canine and a perfect lower premolar—but no bones.

PHASCOLOGALE FLAVIPES, Waterh.

This small pouched mouse is represented by a very large number of jaws and other remains. It appears to be the commonest species in the deposit with the exception of the Bush Rat. So far as I have been able to make out, the fossil animal in no way differs from the existing species. *Phascologale flavipes* is still found in the district, and though it is very rare if not extinct in the settled parts, in the wilder regions it is fairly common.

PHASCOLOGALE PENICILLATA, Shaw.

This species though met with is distinctly rare. I have only found one complete lower jaw, a fragment of a second, and two fragments of the upper jaw. The anterior premolars and canine are a trifle larger than in the recent skull in my possession (a female), but there is no doubt that the remains belong to the

existing species. The form is still met with in the district, though by no means common even in the mountainous regions, while in most of the settled parts it appears to be extinct.

Echidna sp.

(Pl. VIII. figs. 9-10).

A number of bones of a large Echidna have been found, and which in all probability belong to the described form *Echidna oweni*, Krefft. The specimens are, however, too fragmentary to enable me to refer them definitely to this form. The remains comprise the greater portion of the left ilium, with a fragment of the sacrum attached, the lower portion of left femur, the articular head of the femur, two vertebral centra, and a number of fragments of long bones.

The femur differs in one or two respects from *E. aculeata*. The constriction of the shaft immediately above the condyles is much less marked, and the shaft at this part is more flattened than in the common existing species, while the depression above the patellar surface is more marked and broader.

The ilium is very considerably stouter proportionately than in *E. aculeata*. From the union by complete anchylosis of two small fragments of the sacrum with the ilium it is evident that [redacted]

of *Macropus*. There are also innumerable remains of Bush Rats (*Mus* sp.) which I have not had an opportunity of identifying with certainty. Of birds there have been found the perfect cranium of one about the size of a Sparrow and some small bones, while of lizards there occur the remains of a moderate sized member of the *Scincidæ*.

CONCLUDING OBSERVATIONS.

Though a few of the forms found in the deposit are still surviving, the general character of the fauna is very different from that of recent times. With the exception of *Thylacinus*, the *Macropus* and the *Echidna*, the animals may almost all be classed as feeble and defenceless, and have apparently flourished owing to the absence or scarcity of natural enemies. *Dromicia*, *Palæopetaurus* and *Burramys* were probably all of very similar habits, the conditions suitable to the one being equally so to the others, while those inimical to any would probably tend to the destruction of all. The two species of *Phascologale*, though probably suffering from the same adverse condition which has destroyed the small Diprotodonts have been less affected and able to survive. The cause of the destruction of the smaller forms is probably to be found in the introduction into their midst of some common enemy. A glance at the recent fauna of the district suggests a not improbable explanation of the change. To-day the forms which may be said to be numerous are *Trichosurus vulpecula*, *Phascolarctus cinereus*, *Dasyurus viverrinus*, *D. maculatus*, and *Macropus ualabatus*. All these are absent from the deposit, and though their absence does not prove that they were not then in the district, it may safely be taken to indicate that they were at least rare. The absence of the common Phalanger for example could not have been due to unfavourable conditions, as the abundant remains of the species of Ring-tailed Phalanger show there must have been plenty of suitable trees. The conclusion thus seems probable that *Trichosurus* is a comparatively recent addition to the local fauna. If it could be proved that with it came the Dasyures we would have at once a

satisfactory explanation of the disappearance of the small Diprotodonts. It is at present, however, impossible to say more than that at the time of the deposit Dasyures were absent or rare, that in more recent times they have become numerous in the district, and that their introduction or increase has been the probable cause of the destruction of the smaller forms. The fact of *Petaurus breviceps* having not only survived but increased, while the closely allied *Dromicia* has been all but exterminated, seems to suggest that the former with the parachute expansions was able to escape from some enemy to which *Dromicia* fell a prey. *Palæopetaurus*, if we may assume, as is quite probable, that it resembled *Gymnobelideus* in being without lateral expansions, would fall as easily a prey as *Dromicia*.

I must acknowledge my indebtedness to Mr. J. J. Fletcher, Mr. R. Etheridge, Junr., Mr. De Vis, and to my father for kind assistance they have rendered me.

EXPLANATION OF PLATES.

Plate VI.

Macropus wombeyensis

Fig. 1.—Right jaw—nat. size.

[redacted]

Palæopetaurus elegans.

Fig. 3.—Upper aspect of fragment of skull (× 2).

Pseudochirus antiquus.

Fig. 4.—Upper premolars (× 3·6).
Fig. 5.—Lower m^3 (× 4).
Fig. 6.—Back part of lower jaw—nat. size.
Fig. 7—Exactly similar aspect of lower jaw of *Pseudochirus peregrinus.*

Plate VIII.

Perameles wombeyensis.

Fig. 1.—Back part of lower jaw with m^4 (× 2).
Fig. 2.—Anterior part of upper jaw (× 2).
Fig. 3.—Inner view of anterior part of lower jaw of young—nat. size.
Fig. 4.—Inner view of adult lower jaw—nat. size.
Fig. 5.—Right upper m^1 unworn (× 4).
Fig. 6.—Left upper m^2 somewhat worn (× 4).
Fig. 7.—Inner view of lower m^4 (× 5·5).
Fig. 8.—Outer view of lower m^4 (× 5·5).

Echidna sp.

Fig. 9.—
Fig. 10.—

ON A *GALAXIAS* FROM MOUNT KOSCIUSKO

By J. Douglas Ogilby.

At the meeting of this Society in March, 1882 (Vol. vii. p. 107) the late Sir William Macleay read a paper descriptive of a species of *Galaxias* which had been forwarded to him by Baron von Mueller to whom examples had been sent by Mr. S. Findlay, who found them inhabiting the streams which drain the southern slopes of Mount Kosciusko and form a section of the watershed of the Snowy River; for this form he proposed, at the request of Baron von Mueller, the name of *Galaxias findlayi* in honour of its discoverer and collector.

With the exception of its inclusion in the "Supplement" to Macleay's "Descriptive Catalogue of Australian Fishes" there does not appear to be any further published information respecting the Kosciusko Galaxiid, nor do any specimens from that district seem to have been collected until the autumn of 1889, when a few examples were secured and brought to Sydney by Mr. Richard Helms on the occasion of his visit to that mountain, a short account of which is published in the Records of the Australian Museum, Vol. i. pp. 11-16. These specimens were also obtained from streams flowing into the Snowy River, and writing of their [redacted]

which had taken place in the Museum and the consequent shifting of specimens from place to place the examples in question were not immediately forthcoming.

In default of these the next best thing to do was to endeavour to get other specimens from the same locality, and an opportunity for effecting this occurred through the visit in January last of the Rev. J. M. Curran and Mr. C. Hedley to Mount Kosciusko, and the writer thereupon called the attention of the latter gentleman to the subject in the hope of procuring a good working series for examination; however, the specimens thus obtained, two or three in number, were, on Mr. Hedley's return, handed to the authorities of the Australian Museum, and became, therefore, unavailable for the purpose required, which included such an exhaustive examination as the difficulty of determining the species of this intricate genus and the interest attaching to this particular form as an inhabitant of a greater altitude than is reached by any other Australian fish warranted.

In this unsatisfactory state our knowledge must again have been indefinitely left but that, the Rev. Mr. Curran having occasion to return almost immediately to Kosciusko, the writer took advantage of his going to request him to collect sufficient material to enable the complete examination which was deemed necessary to be made. So well was this request acceded to that on the return of that gentleman from his second trip I received a fine series numbering no less than sixteen individuals in perfect condition, and this collection was afterwards supplemented by a further contribution of eleven, and I take this opportunity of acknowledging my obligations and tendering my grateful thanks to that gentleman for the trouble which he took in procuring so fine a series of specimens.

A critical investigation of these examples reveals facts which greatly invalidate certain apparently well established characters which have hitherto been considered of sufficient importance to justify specific separation. As an instance, it will be remembered that the fishes of the genus *Galaxias* have naturally fallen into two groups, characterised the one by a short, stout body, of

which group *truttaceus* may be taken as typical, the other by a long, slender body, to which *attenuatus* and its allies are to be referred; yet in this one small species I am confronted with individuals varying from one-fifth to one-eighth in the proportionate measurement of depth to length, and with a corresponding difference in colour from a dull dark brown without or with but very slight indications of markings to bright golden beautifully blotched, spotted, or barred with black. These differences, however, great as they appear to a casual glance, are entirely attributable to the nature of the locality and the water which the individual fish inhabits, the stout, sombre-coloured form being found in the deep still pools and small subalpine tarns, the slender brilliant one in the more rapid gravelly or sandy shallows where it is exposed to the sunlight; but between these two limital forms every conceivable variation, both of contour and colour, may be found.

The distribution of *Galaxias*, comprising as it does the southern extremities of the three great continental areas which converge upon the Antarctic Circle, is unique among fishes, though the Marsipobranchians of the genera *Geotria* and *Caragola* and the recent members of the clupeoid genus *Diplomystus** somewhat

* The genus *Diplomystus* was instituted by Prof. Cope (Bull. U.S. Geol. Survey Terr. 1877, p. 808) for the accommodation of certain fossil forms of

closely approach it, but in other biological Classes a much more intimate geographical relationship between these Regions may be discerned.*

Several theories have been enunciated to account for this singular distribution of a family of fresh-water fishes in such widely separated regions as western South America, south-eastern Australia, and South Africa. Apparently the most favoured of these theories, as it is also the most natural and the most strongly supported by recent facts, is that, at some remote period of the world's history, there existed a great austral continent, which has now largely disappeared beneath the surface of the ocean and which extended northwards on the one hand through Tierra del Fuego to the southern and south-western parts of South America, on the other through Tasmania to south-eastern Australia, and possibly also to New Zealand and South Africa.

So far as Australia and America are concerned I see no reason to doubt that they were at one time connected at their southern extremities by a belt of land stretching across the south pole, and that the antarctic continent so formed enjoyed a mild and equable climate, and supported a large and varied flora and fauna, the remains of which are abundantly visible in both to the present day, but especially in Australia, where forms of animal life, elsewhere extinct or nearly so, still constitute characteristic features in the faunic aspect, among which may be mentioned the *Marsupialia* among Mammals, the Struthionids among Birds, certain Lizards such as *Chlamydosaurus*, and Fishes such as *Neoceratodus*.

With regard to the claims of New Zealand and South Africa to a post-mesozoic junction with Antarctica the testimony is by no means so convincing, in fact the weight of evidence clearly points to the conclusion that at no more recent time was there any intimate connection between them, while there are many indications that the distance separating them was not so wide as

* For references see Hedley, Proc. Roy. Soc. N.S. Wales, 1895, p. 3, note 1.

to preclude the possibility of many plants and animals finding their way across "either by flight or drift."*

In the case of *Galaxias* the ova might easily have been carried across on the feet or plumage of water-birds, or, as seems to me a more simple and natural solution, some individuals having been swept out to sea by floods in their native rivers, have survived the passage across the intervening belt of ocean and successfully colonised the shores to which they wandered.†

GALAXIAS FINDLAYI.

Galaxias findlayi, Macleay, Proc. Linn. Soc. N. S. Wales, 1882, vii. p. 107.

B. ix. D. 12-13. A. 11-12.‡ V. 9. P. 16. C. 16. Vert. 37-38 23.

Body stout to slender, the head broad and depressed. Length of head $4\frac{3}{4}$ to $5\frac{1}{2}$, depth of body $5\frac{1}{3}$ to 8 in the total length; width of body equal to or a little less than its depth, $1\frac{1}{3}$ to $1\frac{3}{4}$, of interorbital region $2\frac{4}{5}$ to $3\frac{1}{5}$, diameter of eye 4 to $5\frac{2}{5}$ in the length of the head, snouth obtuse, from three-eights to three-fourths of a diameter longer than the eye, which is very small. Lips thick and fleshy, the maxillary reaches to the vertical from the middle of the eye or not quite so far; lower jaw included. Seven or eight

the space between its origin and the base of the caudal $2\frac{2}{5}$ to $2\frac{3}{5}$ in its distance from the extremity of the snout; the fourth and fifth rays are the longest, $1\frac{4}{5}$ to 2 in the length of the head; the base of the fin is $1\frac{1}{10}$ to $1\frac{1}{5}$ in its height and $1\frac{1}{2}$ to $1\frac{3}{5}$ in the space between its origin and that of the anal: the anal fin is similar in shape to and originates beneath the last fourth of the dorsal; the fifth and sixth rays are the longest, as long as or a little longer than the dorsal rays; its base is $1\frac{1}{10}$ to $1\frac{1}{5}$ in its height, and 1 to $1\frac{1}{4}$ in its distance from the caudal: ventral inserted nearer to the anal than to the base of the pectoral, not reaching to beneath the dorsal fin; the distance between its origin and the base of the caudal is $1\frac{1}{10}$ to $1\frac{1}{4}$ in its distance from the tip of the snout; the middle rays are the longest, $1\frac{1}{2}$ to $1\frac{3}{4}$ in the length of the head and 2 to $2\frac{1}{4}$ in the distance between its origin and the anal: pectoral cuneiform, $1\frac{1}{5}$ to $1\frac{1}{2}$ in the head and $2\frac{1}{8}$ to $2\frac{2}{3}$ in the space between its origin and the ventral: caudal slightly emarginate with the lobes rounded, $1\frac{1}{5}$ to $1\frac{1}{3}$ in the length of the head, the peduncle rather slender and compressed, its depth $2\frac{2}{5}$ to $3\frac{1}{5}$ in its length.

Colours variable: from dark greenish-brown above and yellowish-brown below, the sides with more or less distinct darker markings, which may take the form of irregular transverse bands, or of minute spots, which again may be concurrent so as to form blotches or may be distributed so as to almost obliterate the ground-colour, generally with a more or less well defined series of dark spots along the middle of the body, with the fins shading from yellowish-brown basally to orange distally; to golden with regular transverse bands or large blotches of a black or dark chestnut colour, with the fins yellow. Irides silvery.

In addition to the above, the Rev. Mr. Curran tells me that there is in the living fish "over the eye a crescent-shaped area coloured reddish like metallic copper"; that the opercles "are metallic gold and green," and that the sides are irradiated with "peacock hues." As to its habits he reports it as being "very sprightly and lively," and hiding cunningly under stones or in holes in the bank when pursued; also that it leaps to the fly, and

can be easily caught in this way." "I saw some stockmen amusing themselves in this manner, the whole outfit consisting of a piece of black thread, a bent pin, and a fly."

Distribution :—Streams and tarns on Mount Kosciusko and the neighbouring uplands, including the head waters of the Snowy River and its tributary, the Crackenback, where they were obtained by Messrs. Curran and Hedley. Later on the former gentleman obtained specimens from the streams draining the northern and western slopes of Kosciusko and flowing into the Murrumbidgee. Spawning in February.

Eleven specimens measuring from 63 to 105 millimeters, were utilised in drawing up the above description.

Appended is a list of the species of *Galaxias* at present known, arranged in chronological order :—

1801 *alepidotus*, Forster, Bloch and Schneider, Syst. Ichth. p. 395, New Zealand

1817. *truttaceus*, Cuvier, Règne Anim. ii. p. 283; Tasmania and Victoria.

1842 *fasciatus*, Gray, Zool. Misc. p. 73; New Zealand.

1842 *maculatus*, Jenyns, Zool. Beagle, Fish. p. 119, pl. xxii. f. 1. Patagonia, Tierra del Fuego

1866. *olidus*, Günther, Catal. Fish. vi. p. 209; New Zealand.

1866. *kreffti*, Günther, l.c. p. 211; New South Wales.

1866 *punctatus*, Günther, l.c. p. 213; New South Wales.

1866. *brevipinnis*, Günther, l.c.; New Zealand.

1867. *waterhousei*, Krefft, Proc. Zool. Soc. Lond. p. 943; South Australia.

1869. *schomburgkii*, Peters, Monatsb. Ac. Wiss. Berlin, 1868. p. 455; Adelaide, South Australia.

1872. *rostratus*, Klunzinger, Arch. f. Nat. p. 41; Murray River.

1872. *versicolor*, Castelnau, Proc. Zool. Soc. Vic. i. p. 176; Marsh near St. Kilda, Victoria.

1872. *cylindricus*, Castelnau, l.c. p. 177; Lower Yarra, Victoria.

1872. *delicatulus*, Castelnau, l.c. p. 178; River Yarra, Victoria.

1872. *amœnus*, Castelnau, l.c.; River Yarra, Victoria.

1873. *ornatus*, Castelnau, l.c. p. 153; Cardinia Creek, Victoria.

1880. *campbelli*, Sauvage, Bull. Soc. Philom. (7) iv. p. 229; Campbell Island.

1880. *coxi*, Macleay, Proc. Linn. Soc. N. S. Wales, 1880, v. p. 45; Mount Wilson, New South Wales.

1881. *coppingeri*, Günther, Proc. Zool. Soc. Lond. p. 21; Alert Bay, Straits of Magelhaen.

1881. *planiceps*, Macleay, l.c. vi. p. 233; Rankin's Lagoon, Bathurst; New South Wales.

1881. *bongbong*, Macleay, l.c.; Mossvale and rivers at Bongbong; New South Wales.

1881. *nebulosa*, Macleay, l.c. p. 234; Long Bay, Sydney, New South Wales.

1882. *findlayi*, Macleay, l.c. vii. p. 107; Streams on Mount Kosciusko, New South Wales.

1882. *auratus*, Johnston, Proc. Roy. Soc. Tas. p. 131; Great Lakes, Tasmania

1882. *weedoni*, Johnston, l.c.; Mersey River, Tasmania.

1882. *atkinsoni*, Johnston, l.c.; Pieman River, Tasmania.

1886. *kayi*, Ramsay and Ogilby, Proc. Linn. Soc. N. S. Wales (2) i. p. 6; Fifth Creek, Adelaide, South Australia.

1888. *indicus*, Day, Fish. Ind. Suppl. p. 806, fig.; Littoral districts of Bengal and Madras.

1892. *nigothoruk*, Lucas, Proc. Roy. Soc. Vic. (2) iv. p. 28; Lake Nigothoruk, Gippsland, Victoria

1894. *capensis*, Steindachner, Ichth. Beitr. (xvii.) p. 18; Lorenz River, South Africa.

There can be little doubt that many of the species, 32 in number, here catalogued are merely nominal, but, though detailed descriptions of each would doubtless prove of great assistance in indicating the various degrees of affinity which connect the local forms with their antarctic progenitors, it is plainly impossible to even approximately delimitate the species in a satisfactory manner, until a full series of each variety or subspecies shall have been brought together for examination. The local variations in the same form inhabiting the same little subalpine runlets is shown to be so great, as is manifest by the study of the present species, [redacted]

that, to any one who knows the waters, the fish from any given stream may be selected at a glance from those of a dozen other streams, but no one now-a-days would venture to assert that they were of different species, even were it not well known that on being transferred from one stream to another the colonists soon assume the characteristics of the local race.* These variations are attributable (in both genera, *Galaxias* and *Salmo*) to similar local causes, such as the depth, stillness or rapidity of the water, the quality and the supply of food, the character of the bottom, the composition of the water, &c.; indeed as to the latter trout taken from streams fed from limestone springs are as different from those residing in waters which have their origin in peat mosses as *Galaxias truttaceus* is from *G. attenuatus*.

As to the affinities of the species, it is useless in the present state of our knowledge to attempt any generalisation, and it is only by obtaining a series of specimens from the localities whence they were originally described that such species as Castelnau's and (in a less degree) Macleay's can be with certainty identified; nevertheless the following corrections and suggestions may be of use:—

Galaxias olidus, Günth., doubtfully attributed by that author to Queensland, proves to be a New Zealand species, and must be erased from the number of Australian fishes.

Galaxias waterhousei, Krefft, is a variety of *G. attenuatus* according to Klunzinger, as is also *G. obtusus*, Klunz. (Sitzb. Ak. Wiss. Wien, 1879, lxxx. i. p. 412). I mention this latter fact because Lucas includes both *attenuatus* and *obtusus* in his "Census of Victorian Fishes, 1889";† although Klunzinger had himself pointed out his own error (*l.c.*), while he omits *truttaceus* which that author had received from "Port Phillip." G. *schomburghii*, Peters, and G. *hayi*, R. and O. are possibly varieties of *Waterhousei*.

* This does not apply with equal force to the anadromous Salmonids.

† Proc. Roy. Soc. Vic. 1889, pp. 15-47.

Galaxias nebulosa, Macleay, is probably the same as *G. scriba*, Val. The variation in the number of the dorsal and anal rays cannot be considered of any value in this genus if the small unarticulated anterior rays be included, the number of these being extremely inconstant: there is no other character of sufficient consequence to warrant their separation except the size of the eye, which is stated by Valenciennes to measure "two-fifths of the length of the head," a proportion which is quite unknown among the members of the genus, and is very unlikely to be correct. *G. rostratus*, Klunz., should also be compared with *scriba*.

Galaxias auratus, Johnston. Through the courtesy of Mr. Alexander Morton of the Tasmanian Museum, I have had an opportunity of examining two fine examples—225 and 185 millimeters in length—of the form inhabiting the Great Lakes, Tasmania, which lie at an altitude of 4000 feet above the sea level. These specimens I believe to be mere varieties of *G. truttaceus*, modified by their surroundings.

Galaxias indicus, Day. From the first I looked with distrust on the possibility of the occurrence of a species of this genus in Indian waters, and I am, therefore, pleased to find that Dr. Gill not only shares that distrust, but has had the courage to publish [illegible]

Finally I am not satisfied, notwithstanding my scepticism with regard to the number of Australian species, to accept as proved the identity of the New Zealand and Tasmanian *attenuatus* with the Falkland Island and Peruvian form, referred to by Günther under the same name, nor am I prepared to go as far as Macleay in considering that "it is more than probable that they"—all the known forms of *Galaxias*—"are one and all only permanent local varieties of the same fish."

THE ENTOMOLOGY OF THE GRASS-TREES (*XANTHORRHŒA*).

By Walter W. Froggatt.

(Plate IX.)

Four species of *Xanthorrhœa* are recorded from the County of Cumberland, within the limits of which all my entomological specimens have been collected; as their general structure is similar, it is not surprising that the same species of insects are to be found frequenting all four alike.

At first sight a grass-tree might not appear to be a profitable field for investigation by the entomologist; yet whether alive or dead it is the home of a considerable number of interesting insects, some of which are born and die in it, while others are only passing visitors. A grass-tree presents three distinct parts, each with its special frequenters; first the stout cylindrical stem or trunk, generally two or three feet high, and consisting of a tubular sheath composed of the basal portion of the fallen leaves matted together into a solid ring, and thickly impregnated with the yellow resinous gum, and in which nothing lives; this encloses the caudex, composed of close fibrous matter, which in a living [redacted]

COLEOPTERA.

MICROPŒCILA BREWERI, Janson.

Larva about $1\frac{1}{2}$ inches in length; white, rather elongate and cylindrical; head reddish-brown, rugose, rounded behind, slightly impressed in the centre with a wavy line running across on either side to the base of the antennæ; stout black jaws armed with three small blunt teeth; a broad elongate brown patch on either side of the first thoracic segment, above the first spiracle; legs long, covered with long ferruginous hairs; thoracic segments and first seven abdominal segments furrowed into three ridges covered with short dark spiny bristles, together with a transverse row of longer hairs across the tip; 8th segment smooth and shining, covered with scattered short spines, and tinged with blue from the internal food, the anal segment rounded at the tip.

Beetle $10\frac{1}{2}$ lines in length, all the underside, legs, head, the centre of the thorax and elytra smooth, shining black, with a broad marginal band encircling the thorax and elytra deep orange yellow; sides of the wing-covers showing shallow punctured parallel striæ.

Near Hornsby I obtained a large number of larvæ early in July from a patch of dead grass-trees in which they were living in the rich black vegetable mould into which the inner portion of the caudex had been transformed by the action of the weather and their jaws. Towards the beginning of May they began to form earthy oval cocoons on the bottom of the tin, where they remained until the end of November, when the beetles began to come out.

The beetles are found with many others feeding upon the flowers of the dwarf Angophora.

CISSEIS 12-MACULATA, Fab.

I have never found the larva of this pretty little buprestid, and do not know anything about its life-history, but the beetle is common about Sydney in early summer, feeding upon the

leaves, clasping the foliage with its legs, but dropping to th ground at the least alarm.

Beetle 5 lines in length, with the head bright metallic green thorax and elytra of a much darker tint, the whole deeply an closely punctured; sides of the thorax ornamented with a pal buff patch on either side, with four transverse rows of the sam coloured oval spots, the first and last containing two and th middle ones four each, undersurface of a bright metallic greer with a patch of buff below the hind legs, and at the margin each abdominal segment.

Trigonotarsus rugosus, Boisd.

(Plate ix., figs. 1-3.)

Larva with smooth castaneous head; thoracic segments pal reddish-brown and not more than half as thick as the centre o the pale yellow abdominal ones, which are generally arched u behind the head, length in repose about an inch, but whe moving about it extends its body half as far again, thoraci segments rather flattened upon the dorsal surface, with th abdominal ones of a uniform length and very much wrinkled anal one terminating with two short truncate tubercles of reddish-brown colour, with several smaller ones round them.

Beetle is 16 lines in length, stout and rather flattened on the back, of a uniform black colour, with the broad head and thorax finely rugose, the elytra being deeply ridged with regular punctured striæ. The curious form of the tips of the tibiæ which terminate in a long slender spine projecting beyond the tarsi enables it if touched to cling very tightly to anything when laid upon its back.

ACANTHOLOPHUS MARSHAMI, Kirby.

This is the common Amycterid about the neighbourhood of Sydney. Most of the members of this large genus live upon the grass, but this one climbs up the leaves of the grass-tree, and clinging round them gnaws pieces out.

Beetle slightly under an inch in length; of a sooty-brown colour; the head stout, an angular spine on either side between the antennæ, a stout double pointed knob in front of each eye, and the antennæ and mouth parts hairy; thorax rather oval, flattened on the summit but very rugose, with three stout conical spines along the outer margins, and two irregular lines of shorter ones divided by the stout median suture; legs stout, with tibiæ and tarsi hairy; elytra broad, flattened on the summit, the sides transversely corrugated, the upper margins ornamented with an irregular line of large conical spines and numerous smaller ones covering the whole of the back; abdominal plates beneath covered with fine silvery scales or hairs.

TRANES sp.

Beetle 6 lines in length, all black; head small; snout long and stout; antennæ thick at the tip; thorax rounded in front, the sides flattened on the summit and thickly covered with fine circular punctures; legs short and strong; dark ferruginous, with the tarsi lighter coloured; elytra much broader than thorax, which is arched slightly in front, flattened on the back, and thickly ribbed with parallel deeply punctuate striæ.

This beetle is not very common; it occurs towards the base of the flower stalk and the young leaves. My specimens were obtained from trees at the Hawkesbury.

SYMPHYLETES SOLANDRI, Fabr.

The life-history of this fine longicorn is given by me in detail in the Proceedings of this Society (Vol. ix. (2), p. 115, 1894). Though not generally a very common beetle unless in an exceptional season, it is one that is very easily bred from infested flowerstalks if kept in a box.

XANTHOLINUS ERYTHROPTERUS, Erichs.

(Plate IX., figs. 4-5.)

Larva slender, flattened, 7½ lines in length, with the head, prothorax, and legs ferruginous, the rest of the thoracic and all the abdominal segments pale yellow, lightly fringed with hairs; head longer than broad, rounded behind, and armed with long slender black jaws; antennæ 4-jointed, 2nd and 3rd joints long, slender, and swollen at the apex, 4th shorter and rounded at the tip; prothorax rounded in front, truncate behind, both head and thorax with a slight median suture; legs short and thick, with slender tarsal claws; abdominal segments uniform with metathorax, the anal one tapering to the tip and armed with a slender hairy appendage on either side.

Pupa is a tightly swathed ferruginous bundle, the thoracic [redacted]

short, thickly fringed and lightly covered upon both sides with long blackish hairs, first four segments of uniform size, fifth nearly twice as wide and tapering to the small anal segment.

These larvæ are plentiful in spring between the sheath and the caudex, preying upon the many minute creatures attracted by the decaying matter. Like others of the *Staphylinidæ*, the beetles are very active, and are found in the same stumps with the larvæ; the pupa bred out in the Museum under glass in some damp earth.

HOLOLEPTA SIDNENSIS, Marsham.

This is one of the commonest beetles found in the top of the decaying caudex, or between it and the outer sheath. Though I have examined great numbers of the stems at all seasons of the year, I have never come across the larval or pupal forms.

Over half an inch in length, smooth, shining black, broad and flat; the head armed in front with two curved stout pointed horns projecting in front of the eyes and touching at the tips, hollowed out in front at base of horns, with an excavation behind the eyes, and a small blunt spine on the side; thorax with a faint impressed line in the centre, and along the outer edges slightly pitted with small punctures; elytra without any punctures, but a slender purse-like cavity on either margin caused by the edge of the elytra turning upwards; chitinous plates covering the apex of the abdomen impressed with larger rounded punctures on their edges; underside except the central plate between the legs also finely punctured.

I have never collected this species anywhere else, though others in the north are often found crawling on tree trunks.

PLATYSOMA, sp. ?

This beetle evidently passes through all its transformations in the decaying caudex, but after examining a great number of plants in all stages of decay, and at all seasons of the year, I have never been able to identify the larva, though once or twice I have found the pupa just ready to turn into the perfect insect,

from which it only differs in colour, being dull white. The beetles are often very numerous, twenty or thirty being obtained from one stump.

Beetle $1\frac{1}{2}$ lines in length, broad and oval, black and shining; head small, round in front; thorax smooth, truncate behind; elytra smooth in the centre, with four very distinct striæ on each side, and truncate at the apex; the tip of the abdomen sloping downwards.

ALLECULA SUBSULCATA (?), Macl.

Larva is a typical heteromerous wire worm; slender, cylindrical, smooth, and shining, about an inch in length, of a uniform ochreous colour; head and tip of the abdomen ferruginous, and an apical narrow band round the abdominal segments dark brown; head small, rounded in front, with slender sickle-shaped jaws, short antennæ, and long drooping palpi; legs are comparatively long, with slender tarsal claws.

They are very active little creatures, living in the rich black mould left by the decaying caudex, sometimes they are very numerous; common in July and August.

Pupa pale yellow, short and angular, with the head drawn down over the thorax, antennæ curling round under the fore legs, and coming over the hind ones, labial palpi projecting over the fore legs and showing the peculiar axe-shaped terminal joint; outer edges of the abdominal segments flanged and finely serrate, the anal one terminating in two fine spines, wing cases short and wrinkled.

[redacted]

The beetles began to emerge from the earth, in which the larvæ had buried themselves, about the middle of November.

They are often found in the summer time hiding among the dead leaves among the bushes or clinging to the twigs.

HYMENOPTERA.

Lestis bombiliformis, Smith.

This beautiful carpenter bee forms its nest in the flower stalks of the grass-trees found about Sydney, after they have borne the flower and have become dry and hard. It begins by boring a circular hole, $1\frac{1}{2}$ lines in diameter, about three or four feet up the stalk, towards the centre, when it turns downwards, excavating carefully all the pith out for a distance of about four inches down, then working upwards, so that the tunnel is about eight inches from end to end, with an average of half an inch in diameter. The cells are made about half an inch in length, with a ball of bee-bread and an egg deposited in the far end, each being partitioned off from the other by a stout pad or wad of triturated pith. I have never found the whole length of the chamber filled with bee larvæ, a space being usually left unoccupied in the centre.

Larva a dull white-coloured grub of cylindrical shape, attenuated towards both extremities, about half an inch in length when full grown. They can be found in all stages about November.

♂. Bee $7\frac{1}{2}$ lines in length, bright metallic green, with the face yellow, eyes brown, antennæ, ocelli, and mouth parts black, sides of the face, back of head, thorax and legs thickly covered with short golden yellow hairs, with three dark parallel bars of blackish hairs crossing the centre and on either side, above the wings clouded with brown, covered with fine brown spots over the marginal cells, and having fine metallic purple iridescence; upper surface of the abdominal segments finely rugose, without hairs, under surface covered with dark brown hairs, the tip with black.

♀. Bee 9 lines in length, of a brilliant metallic blue colour, with the abdominal segments showing coppery tints, face and

head behind the eyes covered with greyish white hairs, thor legs, and under surface of abdomen thickly clothed with bla hairs except the sides of the anal segments, which are fring with white hairs; wings darker than in the male.

Mr. F. Smith gave a short account* of the habits of this b communicated to him by Mr. Ker, who stated that it inhabit the hollow stem of a Zamia or grass tree, the entrance to t tube being rounded like the mouth of a flute.

Dolichoderus doriæ, Emery.

These ants are very common about Hornsby, and are very fo of the sweet sugary lerp formed upon the leaves of the Eucaly by the larvæ of several species of *Psylla*, so that where the le is plentiful the leaves are often covered with them, all intent up the enjoyment of their sweet food. They form their nest betwe the caudex and dry outer sheath of the dead and dry grass trees, often in such numbers that the cavity between the caudex and the outer mass is a living mass of ants.

Ant ☿, 4 lines in length, head and thorax black, very rugose, the latter armed with a pair of stout spines projecting in front of the prothorax, with a similar pair at the base of the metathorax, longer and pointing downwards; antennæ and legs ferruginous, the node short but stout; abdomen black, covered with a brownish pubescence, heart-shaped, hollowed out in front down the centre, with the outer margins rounded and forming regular rounded tips.

Iridomyrmex gracilis, Lowne.

[redacted]

large, smooth, and shining, truncate at the base, and rounded towards the jaws; thorax narrow, smooth and shining; abdomen short, rounded and pointed towards the tip.

DIPTERA.

ORTHOPROSOPA NIGRA, Macq.

(Plate IX., figs. 6-8.)

Larva 8 lines in length, dirty white to brownish, rounded at the head, widest about the centre, tapering towards the tip of abdomen which is produced into a stout horny ochreous appendage truncate at the tip and armed at the base with a short fleshy spine on either side.

The maggots, frequently in great numbers, are found living in the slime and putrid water which accumulates between the outer shell and the caudex of the dead stem, about midwinter; numbers kept under observation remained about six weeks before changing into pupæ. The latter were simply the skin of the maggot hardened into a brown oval case covered with particles of earth attached to it, and the anal appendage shortened and retracted.

This handsome fly (one of the *Syrphidæ*) is 7 lines in length, shining black, with the antennæ and face bright yellow; thorax covered with a very short fine blackish down and ornamented with a pair of rounded naked black spots in the centre; wings slightly fuscous, legs black; abdomen stoutest at the base, rounded towards the tip.

ORTHOPROSOPA sp.

(Plate IX., figs. 9-11.)

Larva dirty white, 10 lines in length, but able to retract or extend its segments considerably; head rather truncate in front, with the sides round, narrow, with segments of uniform size, tapering towards the tip which is produced into a slender fleshy tail; two-thirds of the length of the whole of the body terminating in a slender horny tube or spine, truncate at the tip.

The larvæ live in the decaying wood and putrid water that accumulated between the caudex and the sheath, crawling ab mixed up with the maggots of the last described species, someti in considerable numbers. Specimens kept in a damp jar pupa among the rotten wood at the bottom about three weeks after t were taken. Pupa case light brown, covered with bits of d the apex and sides rounded, oval, with the long slender segment produced into a slender tube curving sharply round, retaining the anal tube at the tip.

Fly 5 lines in length, steely blue, thorax and abdomen smoot and shining; face and antennæ covered with fine hairs, the latte short with the last segment oval and flattened, ornamented wit a fine bristle, legs piceous, covered with fine hairs; wings hyaline very slightly clouded.

EPHIPPIUM ALBITARSIS (?), Bigot.

(Plate IX., figs. 12-13.)

Larva 8 lines in length, 2 in width, varying from greyish-brown to black; head much narrower, slender, horny, broadest at the base, sloping up to a truncate tip, with an eye-like spot on either side, and several short bristles along the sides, the mouth concave; thoracic and abdominal segments broad, convex on both dorsal and ventral surfaces, the hind margin of the first five sloping back, first arcuate behind the head, narrow, the following ones gradually increasing in size to the fourth, and of a uniform width to the ninth, tenth smaller, the last spatulate with a round

about three months before the flies began to emerge about the end of September.

Fly varying from 4½ to 3 lines in length, all black except the white tarsi; head broad, rugose between the eyes; antennæ spindle-shaped, pointed towards the tips, standing straight out, without any terminal bristle; thorax rounded in front, broadest about the middle, finely granulated on the dorsal surface; scutellum almost square, the apical edge having a short spine on either side; legs stout; wings dusky, nervures black, the wings creased in the centre and folded down over the tip of the abdomen; the latter constricted at the base, large and round, finely granulated, with the apical segments turning downwards, and the extreme tip truncate.

This is a typical form of the family *Stratiomyiidæ*, and is, I believe, identical with Bigot's *C. albitarsis*, one of the few described Australian species.

Another very pretty little fly also lives in the rotten caudex, the larvæ of which I have never observed, but have bred several from the pupæ, which are oval brown cases covered with particles of earth, the front broadest, with a cylindrical short truncate spine on either side, standing out like a little horn, the apical tip rather pointed.

The fly, which belongs to the family *Trypetinæ*, is often found upon the leaves, moving its wings up and down (as many members of this family do when resting), but is very hard to catch; common in November.

Fly 3 lines in length; head black, narrow; last joint of the antennæ large and circular, terminated with a stout bristle; head and thorax hairy, the latter steely blue; scutellum large, yellow, with black markings on the apical edge which is truncate and fringed with hairs; legs long, pale yellow; wings hyaline, thickly mottled with irregular black blotches over the apical half; abdomen broad, heart-shaped, pale ochreous yellow, rounded on dorsal surface, with a curious imprinted brown mark in centre; thin and flat on the underside, tinged with black towards the tip, and tufted with silvery white hairs on the sides.

LEPIDOPTERA.

Aphomia latro, Zeller.

Larva half an inch in length, dark brown to black upon the dorsal surface, with lighter parallel stripes down the centre of back, and along each side, head large, smooth, shining, and divided in the centre by a suture; prothorax rounded and large; other thoracic segments uniform with the abdominal ones; legs moderately stout, with small pointed tarsal claws; ventral surface pale yellow.

The larvæ live in small communities, feeding upon the scape of the flower stalk, gnawing up all the undeveloped buds, which become matted together with their loose web They move about very rapidly, and pupate on the flower head, forming elongate white silken cocoons.

Pupa long and slender, reddish-brown, with the wing-cases curving round in front and covering the first five segments; a raised ridge running down the centre of back; anal segment armed with a number of short conical spines.

Moth $1\frac{1}{2}$ inches across the wings, which are long and slender, and rounded at the tips; creamy buff colour shot with fine black spots, and divided down the centre with a broad parallel stripe of [illegible] Hind wings [illegible] grey, thickly [illegible] long

CHIONASPIS EUGENIÆ, Mask.

I found this scale very plentiful upon the leaves of a patch of grass-trees last March at Botany, but it is more generally found upon *Leptospermum*, *Melaleuca*, and *Eugenia*. The adult female coccids are pale yellow at the tip, with the long slender test pearly white, and are attached along the outer edge of the under-surface of the leaves.

EXPLANATION OF PLATES.

Trigonotarsus rugosus, Boisd.

Fig. 1.—Larva (nat. size).
Fig. 2.—Larva—front view of head (enlarged).
Fig. 3.—Pupa (nat. size).

Xantholinus erythropterus, Erichs.

Fig. 4.—Larva (enlarged). The line beside shows the length.
Fig. 5.—Pupa (enlarged). The line beside shows the length.

Orthoprosopa nigra, Macq.

Fig. 6.—Larva (enlarged).
Fig. 7.—Pupa (enlarged).
Fig. 8.—Fly (enlarged).

Orthoprosopa sp.

Fig. 9.—Larva (enlarged).
Fig. 10.—Pupa (enlarged).
Fig. 11.—Fly (enlarged).

Ephippium albitarsis (?), Bigot.

Fig. 12.—Larva (much enlarged).
Fig. 13.—Fly (enlarged).

NOTES AND EXHIBITS.

Mr. North exhibited the types of the new genus and species of birds obtained by the members of the "Horn Expedition" in Central Australia, and described by him in the July number of "The Ibis" for 1895, also more fully in the "Report of the Horn Scientific Expedition," Part II Zoology, just published. The genus *Spathopterus* formed for the reception of the Princess of Wales' Parrakeet is a most extraordinary one. The fully adult male, of which a beautiful specimen was exhibited, has the end of the third primary prolonged half an inch beyond the second and terminating in a spatulate tip. It is entirely different from the wing of any other bird found in Australia, but the peculiar terminations of the third primaries resemble somewhat the tail-like appendages to the lower wings of the Queensland butterfly *Papilio ulysses*. The new species comprised the following:—*Rhipidura albicauda*, *Xerophila nigricincta*, *Ptilotis keartlandi*, *Climacteris superciliosa*, *Turnix leucogaster*, and *Calamanthus isabellinus*, a sub-species of *C. campestris*, Gould.

Mr. Hedley exhibited on behalf of Mr. J. Jennings some living *Strombus luhuanus* from Vaucluse. As none had been observed alive for several years it had been feared that this interesting colony, the most southern recorded of this species, had become extinct, a fear happily now shown to be unfounded.

Mr. Rainbow showed a Sydney spider (*Celænia excavata*, Koch)

WEDNESDAY, MAY 27TH, 1896.

The Ordinary Monthly Meeting of the Society was held in the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, May 27th, 1896.

The President, Henry Deane, Esq., M.A., F.L.S., in the Chair.

Mrs. Aghes Kenyon, Richmond, Victoria, was elected an Associate Member of the Society.

The Special General Meeting, of which notice had been given, was postponed.

DONATIONS.

Pharmaceutical Journal of Australasia. Vol. ix. No. 4 (April, 1896). *From the Editor.*

Société d' Horticulture du Doubs, Besançon—Bulletin. Sér. Illustrée. No. 3 (March, 1896). *From the Society.*

U.S. Dept. of Agriculture — Division of Ornithology and Mammalogy — Bulletin. No. 8: Division of Entomology — New Series. Bulletin. No 3. Technical Series. No. 2. *From the Secretary of Agriculture.*

Asiatic Society of Bengal—Journal. N.S. Vol. lxiv. (1895). Part i. No. 3 ; Part ii. No. 3. *From the Society.*

Royal Society of Victoria.—Proceedings (1895). Vol. viii. (New Series). *From the Society.*

Geelong Naturalist. Vol. v. No. 3 (April, 1896). *From the Geelong Field Naturalists' Club.*

K. K. Zoologisch-botanische Gesellschaft in Wien.—Verhandlungen. xlvi. Bd. Jahrgang 1896. 2 Heft. *From the Society.*

Bureau of Agriculture, Perth, W.A.—Journal. Vol. iii. Nos. 7, 8, 10 and 11 (March-May, 1896). *From the Secretary.*

Pamphlet entitled "Sur la Deuxième Campagne Scientifique de la Princesse Alice." Par S. A. S. Albert I[er]., Prince de Monaco. *From the Author.*

Papuan Plants. No. ix., Iconography of Candolleaceous Plants. First Decade (1892). By Baron Ferd. von Mueller, K.C.M.G., M. & Ph.D., LL.D., F.R.S. *From the Author.*

Museo de la Plata.—Anales. i. (1890-91). Seccion de Arqueologia. ii.-iii. (1892); Seccion Geologica y Mineralogica. i (1892), Seccion de Historia General. i (1892); Seccion Zoologica. i.-iii. (1893-95); Paleontologia Argentina. ii.-iii. (1893-94): Revista. T. i.-v. (1890-94). T. vi. Primera Parte (1894). T. vii. Primera Parte (1895): Pamphlets entitled "The La Plata Museum." By

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Victorian Naturalist. Vol. xiii. No. 1 (April, 1896). *From the Field Naturalists' Club of Victoria.*

Société Royale de Botanique de Belgique—Bulletin. Tome xxxiv. (1895). *From the Society.*

Perak Government Gazette. Vol. ix. Nos. 7-8 (March-April, 1896); Title page, &c., to Vol. viii. (1895). *From the Government Secretary.*

Geological Survey of India—Memoirs. Vol. xxvii. Part i. (1895); Palæontologia Indica. Ser. xiii. Salt-Range Fossils. Vol. ii. Part 1; Ser. xv. Himalayan Fossils. Vol. ii. Trias, Part 2 (1895). *From the Director.*

Cincinnati Society of Natural History—Journal. Vol. xviii. Nos. 1 and 2 (April-July, 1895). *From the Society.*

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Konink. Natuurk. Vereeniging in Nederl. Indië—Tijdschrift. Deel lv. (1896): Supplement-Catalogus (1883-93) der Bibliotheek. *From the Society.*

OBSERVATIONS ON PERIPATUS.

By Thos. Steel, F.C.S.

The following remarks refer entirely to the ordinary New South Wales *Peripatus*, the form for which the name *P. Leuckarti*, var. *orientalis* has been proposed by Mr. Fletcher.*

For some years past I have taken a good deal of interest in this creature amongst other of the cryptozoic fauna of Australia; and having had numerous living specimens of all ages under constant observation in vivaria during a continuous period of over a year, I have thought that my observations would be of interest to naturalists.

In the course of a number of visits to the Moss Vale district during the summer of 1894-5, and again in 1895-6, I was successful in collecting a considerable number of specimens.

The most remarkable feature about my collection, apart from the unusually large number of individuals of both sexes secured, is the very interesting range of colour variation which it illustrates.

It is not my intention to enter into any details regarding classification or structure, but to give a statement of such facts in connection with the habits and life-history of the creature as I have observed; together with a few details of the individual range of colour, and the relative proportions of the sexes in the specimens collected.

The summer of 1894-5 was remarkable, in the district above

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females and 189 males, that is 67 per cent. of the former and 33 per cent. of the latter. Besides these a large number of young, ranging from newly born upwards, were noticed.

The summer of 1895-6 having been preceded by a prolonged spell of very dry weather, the organisms mentioned were found to be very scarce. Where in the previous summer I found hundreds of land Planarians, only scattered individuals of the more hardy and common species were to be met with, and it was only by diligent searching over a somewhat wide area that I was able to secure a very moderate number of Peripati. Particular spots which I specially remembered as being where I met with plenty of specimens in 1894-5, in 1895-6 I found to be quite deserted or very sparingly populated by Peripatus, while the other usual forms of life (with the exception of ants and termites, which seem to flourish under any conditions) were equally scarce in proportion. This collection, though a good deal smaller, contained much the same relative proportions of males and females, and a great range of colour variation, as that made in 1894-5.

When collecting in 1894-5, whenever I saw young Peripati under logs I made it a rule to replace them in the position in which I had found them, and as I noted numbers of these logs I was able to examine them again in 1895-6. In many cases where I had left large numbers of young of various ages I found on my second visit not a trace of any, and in others only a few.

My friend, Mr. C. Frost, F.L.S., informs me that in Victoria, where the summer of 1895-6 was similar to that experienced in New South Wales, he found the land Planarians exceedingly scarce, and in some cases altogether absent, in districts such as Fern Tree Gully, which are known to be usually prolific in these forms of life.

Such dry conditions, and the attendant "bush fires," must cause an enormous mortality amongst these lowly creatures, and it is greatly to be desired that as much information about them as possible should be gained, as many local forms are certain to be now rapidly approaching extermination.

In the favourable summer of 1894-5, the individual adu Peripati ranged very much larger in size than was the case 1895-6. The dry conditions of the latter period appeared have stunted the growth of the creature. In 1894-5 larg numbers of females were 1½ inches in length when crawlin, not counting the antennæ, and the males 1 inch; while in 1895- the longest female seldom exceeded 1 inch and males about ¾ inc These are the dimensions when crawling naturally, and not whe stretched to the fullest extent. What became of the larg sized individuals of 1894-5, I cannot say. They may have perished, or could they have shrunk in size as a result of the unfavourable conditions? Whatever may be the cause, their absence was very marked.

In his account of the Mammalia of the Horn Expedition,[*] Professor Spencer gives exceedingly interesting information on the effect of the prolonged spells of arid conditions on the bodily development of some of the mammals of that region; and of the remarkable manner in which, on the other hand, they respond to the more favourable state of matters when a wet period intervenes.

A somewhat analogous series of observations is quoted in *Nature* from *The Entomologist*,[†] in which Standfuss, of Zurich has investigated the effect on the dimensions, and on the pattern

After a little experience I got to know the likely-looking parts, and even the most promising logs under which to search. All the specimens were underneath logs, either on the ground or on the under surface of the log, and in the cracks and crannies in the ground beneath the logs. Small easily handled logs yield the best results for Peripatus as well as for Land Planarians and the other creatures that live under them; large heavy ones lie too hard and close to the ground, and do not give the necessary room underneath.

The colours of the individuals were exceedingly variable. Adopting a similar method of comparison to that used by Mr. Fletcher* in his description of the collection made by Mr. Helms on Mt. Kosciusko, my specimens very naturally divide themselves into four groups:—*a*. Black or blue-black. *b*. Black, sparingly speckled with rufous brown. *c*. Rufous brown with black antennæ, and with or without visible scattered black spots or markings. *d*. Entirely rufous brown or red, including the antennæ, and without any visible black.

The relative numbers of individuals in each of these classes was:—

a.	Black or blue-black	..	77½ per cent.
b.	Black, speckled with brown	..	6½ ,, ,,
c.	Brown, black antennæ	..	10 ,, ,,
d.	Entirely brown ..	..	6 ,, ,,

In the Mt. Kosciusko collection the proportion of entirely black individuals is very much smaller than the above, amounting to only about 9 per cent. of the whole, the greater number being dark, sparingly speckled with brown.

No specimens with antennæ and body both entirely brown are mentioned and indeed, judging from the published descriptions and my own experience, this particular form appears to be much less common than the others. Such being the case, it may be well for me here to briefly describe those in my collection. To the naked eye or the microscope there is no trace of black visible. The lozenge-shaped pattern which has been so fully treated of by

* P.L.S. N.S.W., (2 Ser.) Vol. x. 471.

Fletcher and Dendy, while quite distinct, is not nearly so boldly outlined as is commonly the case in *P. oviparus*, Dendy; it is marked out by alternate light and dark areas of skin, the pattern being entirely due to differences in intensity of the brown pigment. This form of Peripatus is exceedingly beautiful; it is a very striking object, and from its bright colour, much more conspicious than its black brethren. When a number of specimens of the brown form are put in spirit together, I have noticed that the latter acquires a distinct brown tinge, which would show that the colour pigment, like that of land Planarians, is to some extent soluble in alcohol.

Most if not all of the specimens which to the eye or the pocket lens appear quite black, under the microscope present numerous scattered skin papillæ and minute patches of the skin of a brown colour. The antennæ appear to be the last part to lose the black pigmentation or the first to gain it, whichever the case may be. It very commonly happens that the entire body may be brown and the antennæ alone black, and I have not observed a specimen having entirely brown antennæ which had black on any part of the body.

This recalls to my mind a matter in connection with dogs which I have noticed for many years, that they invariably have the tip of the tail white if there is white on any part of the body, and frequently the tail tip is the only white part.

It may also be noticed that in Peripatus the colour variations are pretty uniformly proportionately divided between the males and females.

It would appear very probable to me that the young are not born until the mother is at least three years old.

The inner twin blades of the jaws lie with their convex edges outwards, the outer simple bladed jaw lying close up to the inner toothed one with the points close together. When feeding the jaws are moved very rapidly, with a circular sweep.

I have counted the claw bearing legs of several hundreds of specimens and have found them invariably fifteen pairs, exclusive of the oral papillæ. In living individuals the narrow white line in the centre of the dorso-median furrow, described by Prof. Dendy in *P. oviparus*,* and by Mr. Fletcher in *P. Leuckarti*† is very readily seen under the microscope in the dark coloured specimens, and can be distinctly observed in the light brown ones also, especially when it crosses patches of the darker brown. In young ones it is even more conspicuous than in adults. In adults a somewhat similar line lies at the bottom of the numerous horizontal skin furrows which cross the median line, and indeed wherever there is a furrow in the skin its course is more or less distinctly marked out by white.

These lines are well seen when the animal is extended in the act of crawling, but when it is at rest they are closed over by the skin folds.

The food of Peripatus consists of insects, wood lice, and such-like. Termites are a favourite article of diet, and are eaten freely. All the soft parts are eaten, including the legs of small insects. The skin of the outer integument of such creatures as wood lice is scraped completely off. Its feeding, as one might expect from the nature of its jaws, is by no means confined to sucking the juices of its prey, but all parts, save the hard integument, are devoured. Of Termites only the hard part of the head is rejected, the remainder, including the antennæ, being entirely eaten.

* P.L.S.N.S.W. (2 ser.) x. 196.

† Ibid. 183.

It is rather interesting to observe the behaviour of wood lice, the creatures with which I have most frequently fed my Peripati, when dropped into the vivarium. At first they scramble under the little pieces of rotten wood, under which the Peripati are lurking, but they very quickly appear to recognise the presence of an enemy and crawl out again, finally clustering together as far as they can get from their foes. Wood lice eat any sort of organic matter, vegetable or animal, and I have seen one biting and nibbling at a sickly Peripatus which was too weak to defend itself.

I have never observed Peripati eat one another; even when kept without food they do not attack each other or the young.

When feeding the movements of the animal are very graceful and deliberate. The antennæ are endowed with a high degree of sensitiveness, and are used by cautiously touching the insect, when so occupied being carried somewhat erect with the tips curved downwards. From the manner of using them sometimes, by bending them round and over an object which is being examined, without touching it I think it is highly probable the antennæ are the medium of a sense analogous to that of smell.

In securing its prey Peripatus does not always use the slime secretion, but appears to resort thereto only when the insect which it [illegible]

Peripatus is a very sociable creature. They do not molest one another, and love to crowd together in congenial lurking-places. I have often observed several of them around one insect feeding in perfect harmony.

Although they will readily feed on dead insects, I have not been able to induce them to eat raw or cooked meat. Occasionally one will after a long examination pull at the meat for a little while with its jaws, but very soon leaves it.

The skin is cast at apparently somewhat irregular intervals, but I have not observed how often. The earliest casting which I have noticed was in the case of young ones born in captivity, which shed the skin when between one and two weeks old. The skin splits along the median dorsal furrow, and is gradually worked off by expansive and contractile movements of the animal, the front end being first worked forward out of the skin and then the whole gradually crumpled off in a very perfect state, including that of the antennæ, feet, and appendages. The exuviæ are pure white, the colour pigment being situated entirely in the inner skin layer which remains.

During the shedding of the skin, the operation is frequently assisted by the animal bending round and pulling at it with its jaws, and as soon as it is cast the skin is often eaten, being taken up by the mouth, worked about for a little while by the jaws, and then swallowed entire.

By watching the creatures I have been able to secure several specimens of the cast skins, and with a little careful floating on water have uncrumpled them and caused them to spread out to their full extent, when they form a very delicate and beautiful object. Examples of these, both young and adult, are amongst the specimens exhibited. The young appear to be usually born fully extended, but at times doubled up in a thin membrane. I am not sure, however, that in the latter case the birth is not somewhat premature. However, the newly-born young soon crawl about, though they generally remain about the mother for several days. When born they are nearly white, but the colour

pigment is plain on the antennæ and those parts of the skin which, in after life, are darkest. I have frequently witnessed the natural birth of the young, and have succeeded in keeping them alive for over twelve months. When newly born they are about 5 mm in length, without the antennæ, and from frequent measurements I have found the rate of growth during the 12 months which I had them under observation to be rather less than 1 mm. per month.

Pregnant females somewhat readily extrude the young when distressed by close confinement or uncomfortable conditions. Frequently soft adventitious eggs are laid. These bear no resemblance to those described by Dendy from *P. oviparus* * but are quite smooth and have a very flaccid thin envelope. They very soon break up into a drop of turbid liquid. My supposition is that they are merely ova which have escaped fertilization, and are thus making their natural exit from the body.

From my own observations I have seen the young born at all times, from the middle of November till the middle of March. Females which I had in captivity from January, 1895, began to give birth to young at the former date, and continued doing so for over a month, while specimens collected in December, January and February of different years, had young in the course of these and

the year they move about very freely at night, crawling all over the accessible parts of the vivarium in which they are confined, and in the day time hiding away in crevices and beneath lumps of earth or pieces of wood.

The kind of vivaria in which I have been most successful in keeping my specimens alive, consist of ordinary glass jam jars having metal lids, which slip or screw on not quite air tight. These are filled with lumps of moist earth and odd pieces of rotten wood. An arrangement such as this is very convenient for observation, and allows of taking out the contents when desired for examination, without injury to the specimens.

DESCRIPTIONS OF NEW AUSTRALIAN FUNGI.

By D. McAlpine, F.L.S.

No. I.

(Communicated by J. H. Maiden, F.L.S.)

Meliola funerea, n.sp.

(Plate x., figs. 1-6.)

Amphigenous, but most developed on upper surface of leaf. Spots velvety, funereal black, with hair-like pile, orbicular or irregular, usually confluent, $\frac{1}{8}$-$\frac{3}{16}$ inch or in a continuous mass $\frac{1}{2}$ inch or more, and very conspicuous.

Mycelium of dark brown, thick-walled, septate, branched interwoven threads, about $8\frac{1}{2}$ μ dia., springing from deeper-seated, delicate, colourless hyphae, about 2 μ dia. Bristles on surface looking like masses of black hairs, rigid, sooty-brown, septate, curved, tapering to a point, generally about 11 μ broad.

Perithecia globose, apparently black but with a distinct purple tint, slightly warted, 310-350 μ diameter.

Asci generally 4-spored, ovate to fusoid, up to 90 × 45 μ. Sporidia brown or yellowish, sausage-shaped or elliptic, 3-septate,

internally steel-gray, smooth, up to 9 mm. high, and 8 mm. across mouth, rigid when dry, flexible when moist; margin slightly revolute at maturity.

Peridiola or sporangia black-lead-like, discoid, irregularly oval in shape, surface slightly wrinkled, with distinct umbilicus, about 2 mm. dia., with white elastic cord stretching to 7 mm., and attaching it to inner wall of peridium. Sometimes the sporangia are attached to outside wall of peridium.

Spores colourless, globose or sub-globose, 24 μ dia., or 24-27 × 21-24 μ, wall sometimes 3 μ broad.

Gregarious, in clusters on cow-dung in March. Near Mercey-road, Homebush, Sydney, N.S.W. (Maiden).

The generic nature of this fungus is seen in the three-layered peridium shown in fig. 2, and in the sporangia being umbilicate in the centre of one side. The wall of the peridium is composed of three layers as seen in microscopic section, an outer dark brown layer about 56 μ thick, an inner paler brown layer about 34 μ thick, and a central layer comparatively transparent and loose in texture like a central medulla or pith about 112 μ thick The average thickness of the entire wall is about 200 μ.

Several species of this genus have been found on dung in Australia, but differ from this one in various respects.

C. baileyi, Mass., is externally tomentose and cinnamon colour, and the spores are only 18-20 × 15-16 μ.

C. fimicola, Berk., is minutely velvety and umber-coloured, and sporangia are of the same colour, while *C. fimetarius*, DC., is tawny-rufous and externally velvety.

The specific name is given from the appearance of the sporangia

PHOMA STENOSPORA, n.sp.

(Plate XI., figs. 13-15.)

Spots small to largish, roughly oval, grey, with distinct reddish-brown margin.

Perithecia on upper surface, minute, black, punctiform, semi-immersed, globular to oval, opening by pore, 112-280 μ diameter.

Sporules hyaline, cylindrical, rounded at both ends, on short straight hyaline stalk, with 3 guttules, one at each end and another central or eccentric, 4 × 1 μ.

On living leaves of *Notelæa longifolia*, Vent., in October. New South Wales (J. H. Maiden).

Before the sporules are expelled a yellow plug of matter is extruded, and then the sporules imbedded in a glairy substance.

EXPLANATION OF PLATES.

Plate x.

Meliola funerea, n.sp.

Fig. 1.—Portion of upper and under surface of leaf, showing spots and blotches (nat. size).

Fig. 2.—*a*, bristle (× 115); *b*, portion of bristle showing septum (× 600).

Fig. 3.—Perithecium split and unsplit (352 μ and 310 μ in diameter), with stiff pointed bristles (× 65).

Fig. 4.—Asci with sporidia (× 600). The sporidia were still pale in colour, and comparatively thin-walled.

Fig. 5.—Asci with sporidia (× 265). *a*, four sporidia dark brown in colour; *b*, pale yellow; *c*, greyish; *d*, *e*, hyaline.

Fig. 6.—Two groups of four fully developed sporidia (× 265).

Cyathus plumbagineus, n.sp.

Fig. 7.—Peridium (nat. size).

Fig. 8.—Section of wall of peridium (× 65).

Fig. 9.—Portion of middle layer of wall (× 600).

DESCRIPTION OF A NEW SPECIES OF *ASTRALIUM* FROM NEW BRITAIN.

By Charles Hedley, F.L.S., and Arthur Willey, D.Sc.

(Plate XII.)

The following species was dredged up by one of us in Talili Bay, off the north-east coast of the Gazelle Peninsula, New Britain, in 30-40 fathoms on a shelly floor, in company with species of *Xenophorus*, *Ranella*, *Oniscia*, *Pleurotoma*, *Fusus*, *Nassa*, *Conus*, &c.

The entire material at our disposal consisted of some three dozen specimens, and was obtained in one haul of the trawl. The stages of growth exhibited ranged from young shells about 16 mm. in diameter, inclusive of spines, to adult shells of some 45 mm. in diameter.

This handsome shell is nearest allied to the well-known Japanese species, *A. triumphans*, from which it differs chiefly by a reduction of the peripheral spines in the adult and in the greater number of spines.

Adopting Pilsbry's classification as given in the Manual of Conchology, Vol. X., it should enter the sub-genus *Guildfordia* of Gray.

Description of Species.

Astralium moniliferum, n.sp.

Shell.—Low, trochiform, imperforate.

Colour.—Light purplish beads on a ground of old gold, with a metallic lustre; paler below.

Whorls.—Seven, inclusive of the embryonic portion of the shell; the upper whorls convex, the last whorl becoming distinctly concave towards the aperture.

Sculpture.—The first three whorls are comparatively smooth, with oblique wavy lines between shoulder and suture; they are angled at the shoulder by a ridge, which commences as a raised thread and at about the fourth whorl breaks up into beads. As growth proceeds, additional bead-lines are intercalated until they reach the number of 8 or 9 rows* on the last whorl, where the subsutural row is composed of large, somewhat oblique, transversely flattened, and closely appressed beads.

Below the subsutural row, the outer rows are placed closer together, the median ones further apart.

The impressed suture is sinuously wound, the spines of the preceding whorl being absorbed.

Periphery is set about in the adult with ten to twelve short forwardly directed, stout, compressed spines† of a maximum length corresponding to about one-third the width of the last whorl; but at the age of four whorls the periphery is armed with 11 closed tubular spines, as long as the whorl is wide.

Base is flattened, becoming convex towards the lower lip of the aperture, a double row of beads, about 50 in a row, forms the margin of the spiked periphery, within which occurs a wide shallow furrow, normally devoid of beads, but frequently containing one or even two intercalated rows; then three or, exceptionally, four rows of beads encircle a heavy boss of callus, excavated at

buttress of callus. A deep sinus is formed by the projection of a tongue of non-nacreous shell, as shewn in the figures accompanying this paper.

Operculum.—Slightly hollowed out on its external surface, very sharply angled on the distal margin, thick and regularly oval.

Dimensions of adult shell.—Height 26 mm., major diameter 45 mm. (maximum measurement), minor diameter about 39 mm.

EXPLANATION OF PLATE.

In both figures the buttress of callus is shown at the upper angle of the aperture. In Fig. 2 only a portion of the bead-rows have been inserted; this specimen had four rows about the central callus, and a row of very small beads at the bottom of the submarginal furrow (indicated by the dark shading). Finally, in Fig. 2, the non-nacreous tongue at the outer margin of the aperture, mentioned in the text, is indicated by the dotted line dividing it off from the nacreous portion of aperture.

ON A RARE VARIATION IN THE SHELL OF *PTEROCERA LAMBIS*, LINN.

By Arthur Willey, D.Sc.

(Communicated by Jas. P. Hill, F.L.S.)

(Plate XIII.)

With the view of ascertaining the nature of the variations which the shell of this common tropical species presented, I recently made a collection, amounting to 67 specimens, both from New Britain and from the Eastern Archipelago of New Guinea, the majority coming from the latter locality.

As might be expected from such a comparatively large series, variations of greater or less intensity were very numerous. I am indebted to Mr Charles Hedley for his kind assistance in arranging and classifying the collection.

As is known, Bateson (Materials for the Study of Variation, London, 1894) has divided variations into two main categories, namely, (1) Meristic variations, comprising numerical variations in members of a series, as the rings of an earthworm or, what concerns us at present, the digitations of *Pterocera*, and (2) Sub- [redacted]

animals, was the apex of the spire entirely fused with and, in one of them, deeply imbedded in the base of the posterior digitation. In the other shell the apex was not imbedded in the posterior digitation, but was applied very closely against it.

Pterocera also varies very much as to the stage of growth at which the deposition of callus on the outer lip of the shell takes place. As is known, this deposition of callus eventually leads to a complete closing up of the canals which, in the younger shells, passed from the mouth of the shell into the tubular digitations. This fact is analogous to what has been observed in some other of the lower animals, namely, that they can become sexually mature at very different sizes, and then cease to grow in linear dimensions.

In the adult animal of *P. lambis*, therefore, the border of the mantle is not digitated.

We now pass on to the description of the rare variation referred to in the title of this paper.

Out of the whole collection only three specimens exhibited a variation in regard to the number of the labial digitations. In all cases the intercalated digitation occurred between the second and third normal digitations. Although small, its presence offered a striking contrast to the other shells. Of the three specimens exhibiting this variation, two (Figs. 1 & 2) came from New Britain. In both cases the rudimentary digitation was backed up by a definite ridge on the outer surface of the shell as is the case with normal digitations.

The third specimen, from New Guinea (Fig. 3), presented a rather puzzling aspect. The intercalated digitation had a double character and was not backed up by a prominent ridge on the outer surface. It appeared to have had a distinctly later origin than in the other two cases. Two furrows proceeded from it to the mouth of the shell, one being independent and the other produced by a bifurcation of the furrow belonging to the second normal digitation.

The constancy in the position of the above described rudimentary intercalated digitation in *P. lambis* should be emphasized.

It can be identified, I think, with absolute certainty, with one of the digitations of *P. millepeda*, Linn., namely, the fourth. I obtained four specimens of *P. millepeda*, which has nine labial digitations, from New Guinea. In two of these the fourth digitation was markedly smaller than any of the others, while agreeing in position with that above described in *P. lambis*. In fact, in *P. millepeda* the intercalated digitations are obviously the second and fourth, and probably the seventh.

It may also be remembered as indicating the significance of the appearance, by variation, of an extra digitation in *P. lambis*, that in P. *elongata*, Swainson, there are eight labial digitations, in *P. violacea*, Swainson, ten, and in *P. chiragra*, Linn., five.

EXPLANATION OF THE FIGURES.

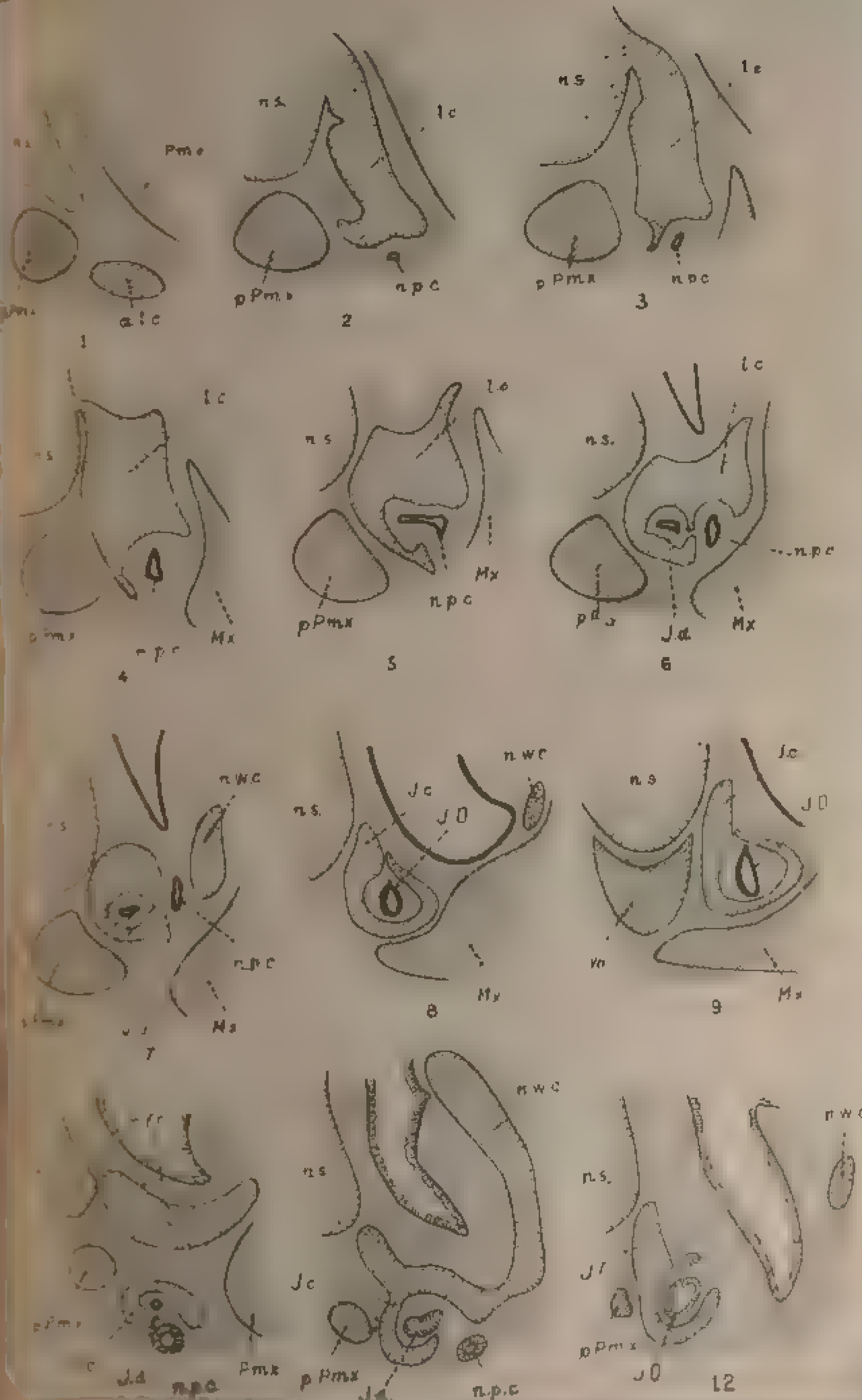
Fig. 1.—The canals leading into the tubular digitations are still open, the deposition of callus having only commenced.

Figs. 2 and 3.—The canals are closed up by callus, their previous existence being indicated by shallow furrows.

i.d., intercalated digitation.

The shell represented in Fig. 1 was the same in which the apex of the spire was imbedded in the posterior digitation as mentioned in the text.

Pl. I



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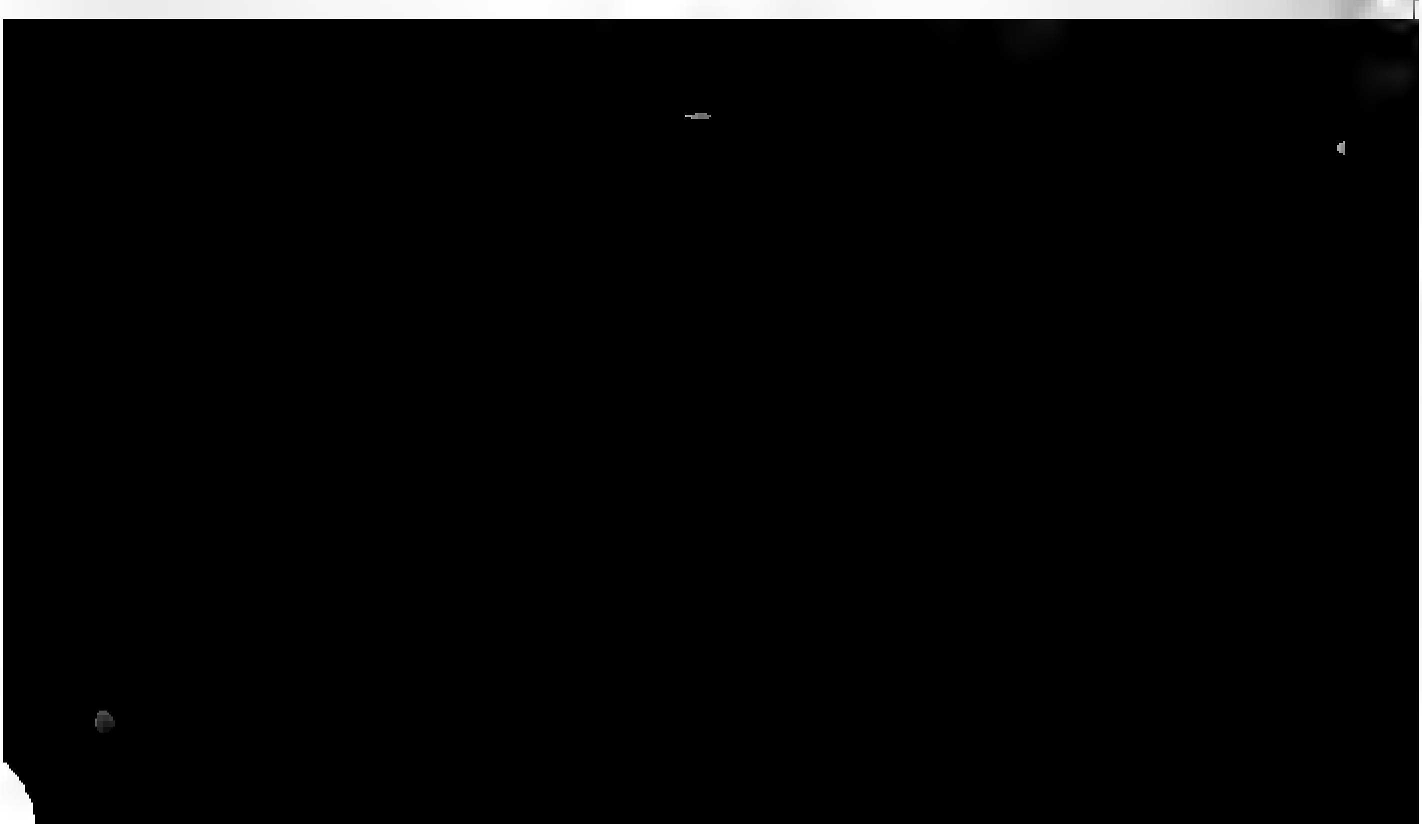


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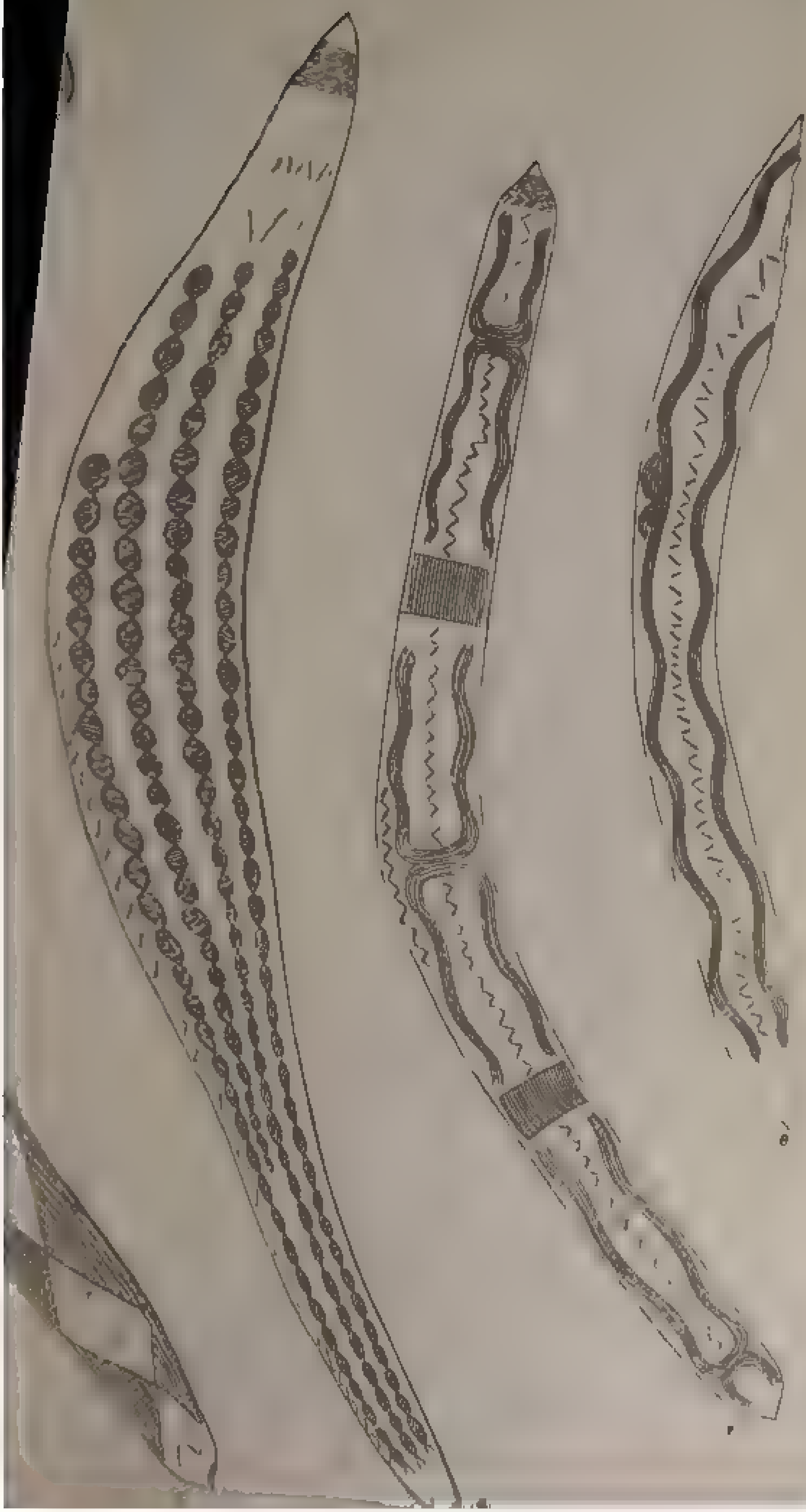
Pl. II.



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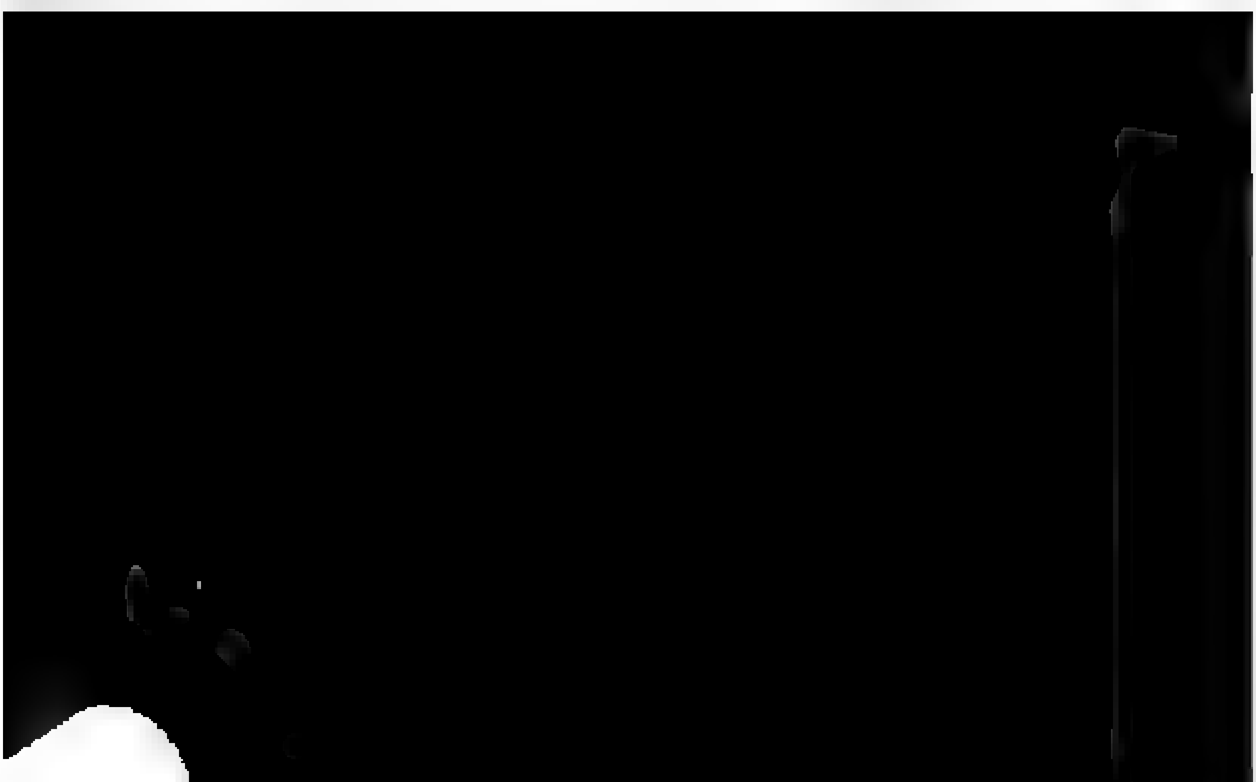

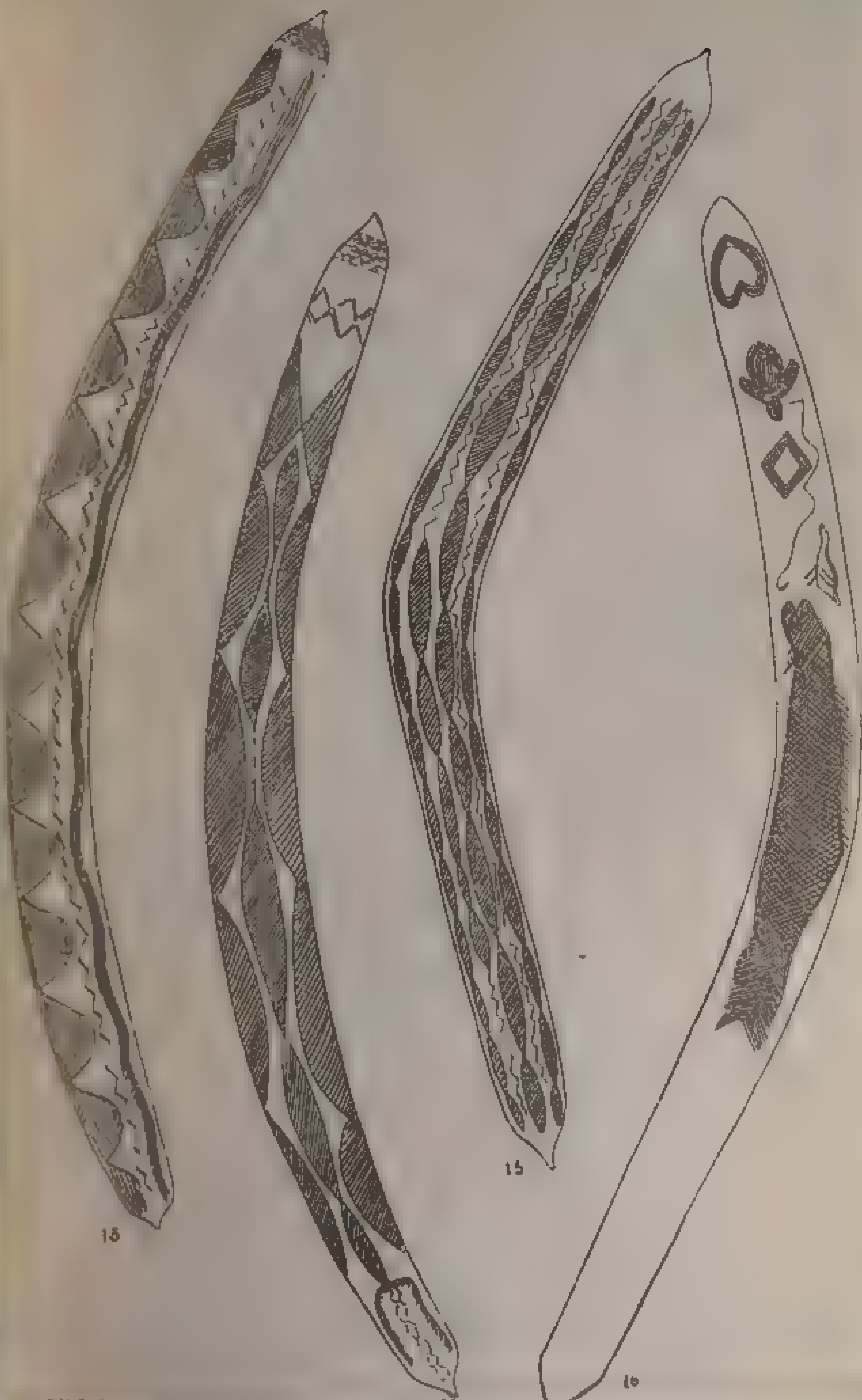

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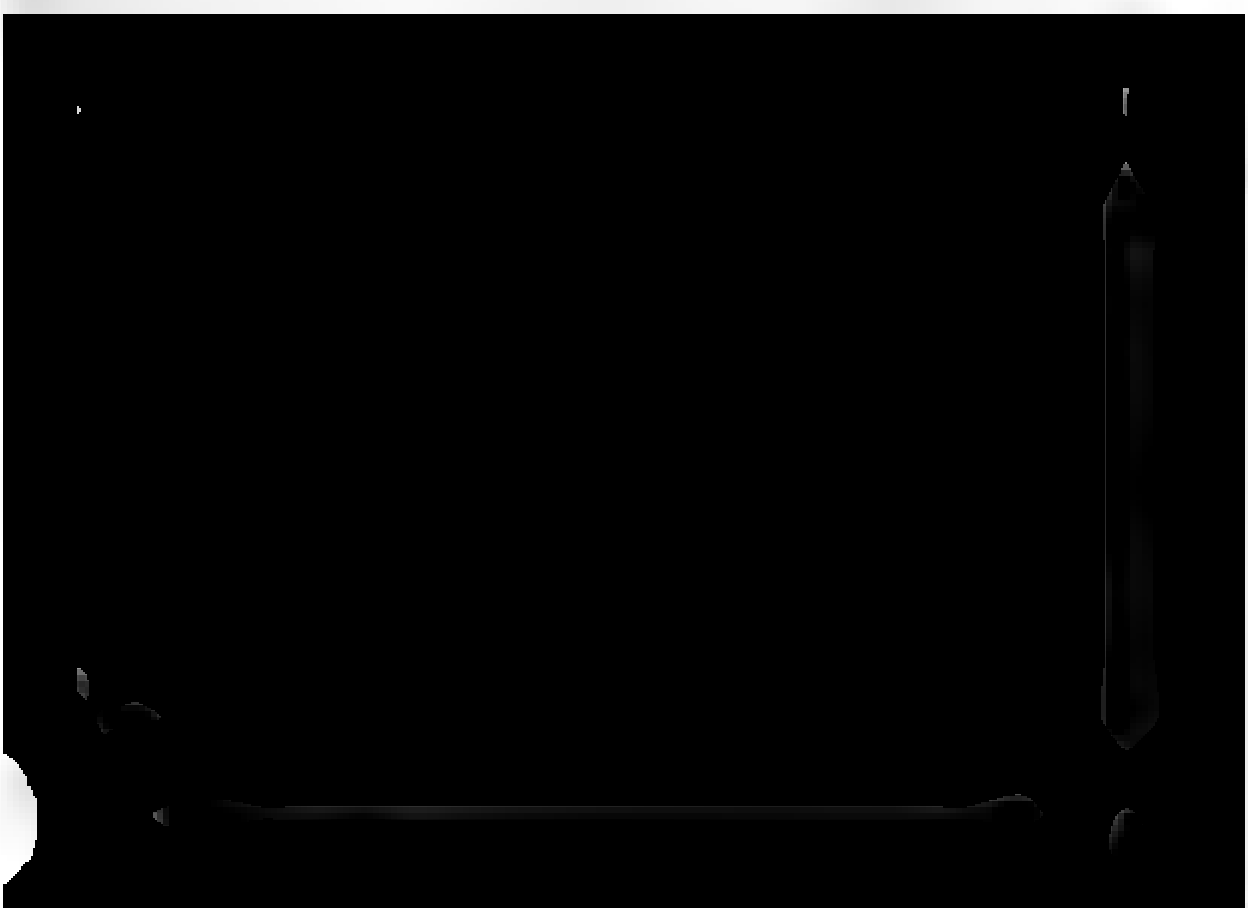

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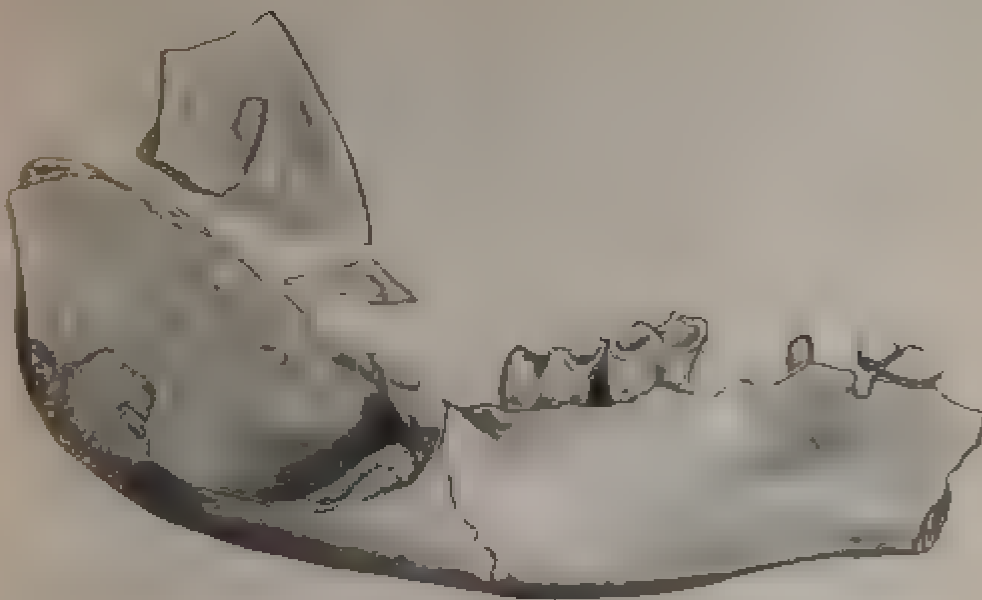

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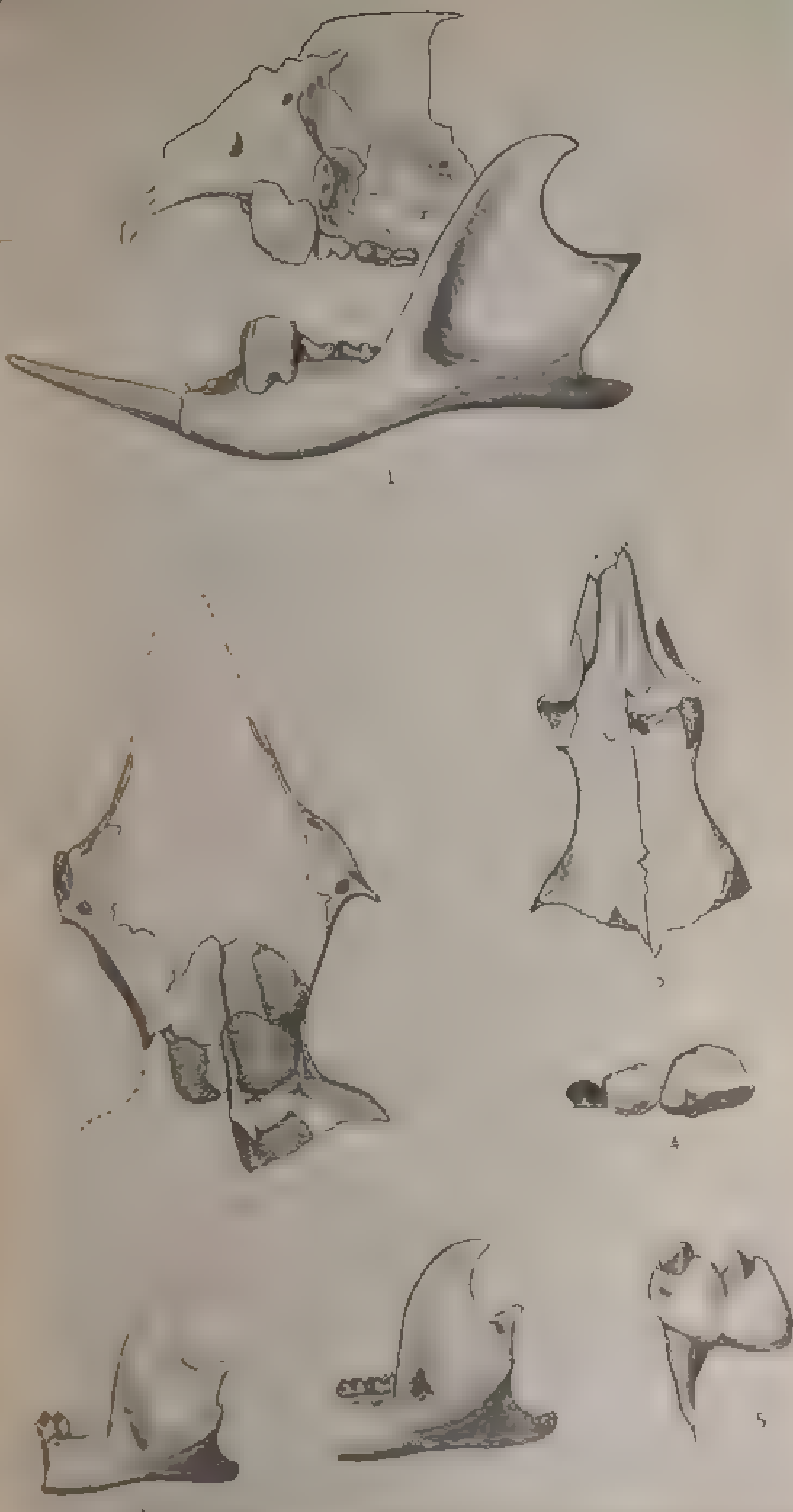
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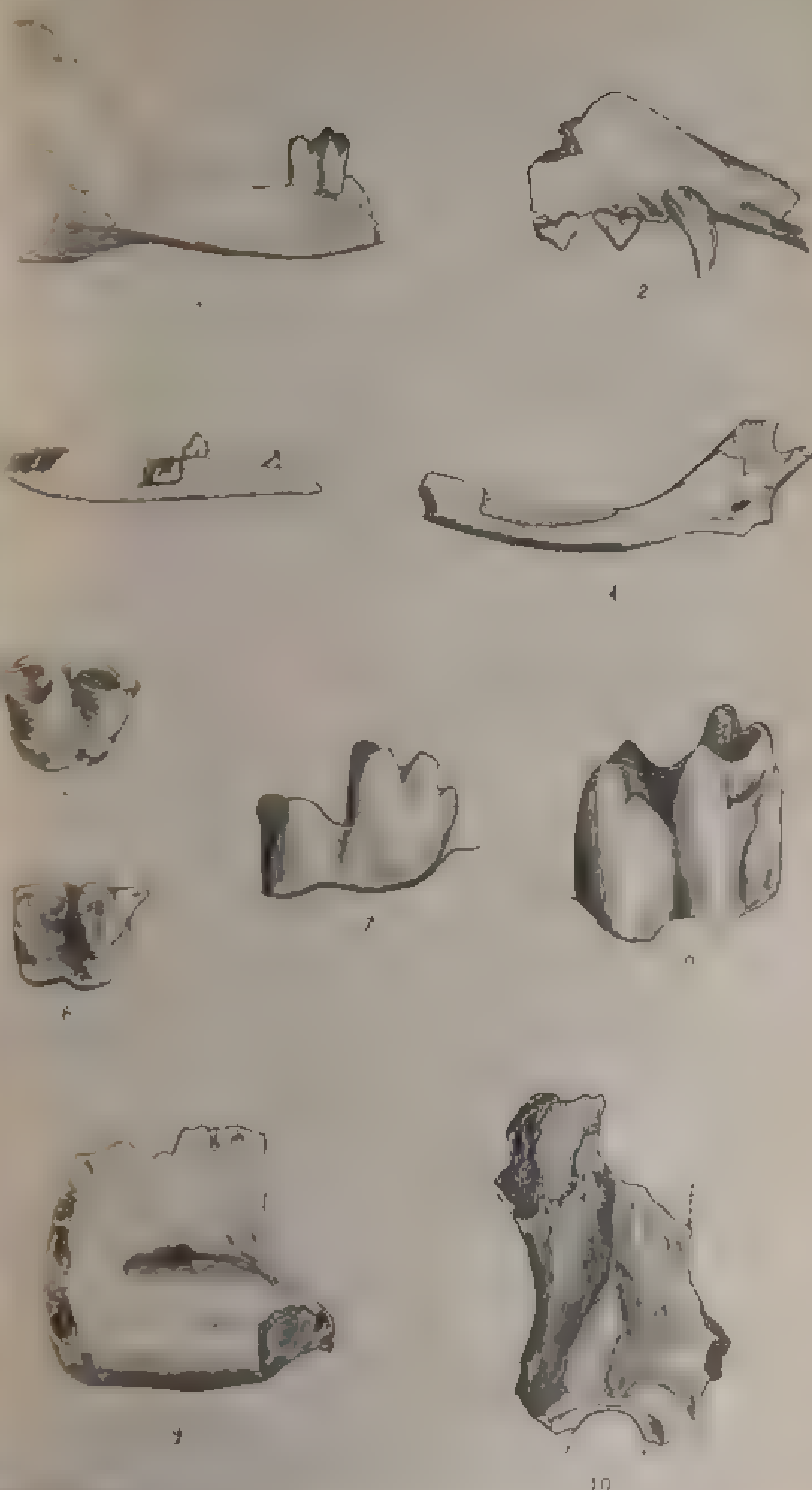

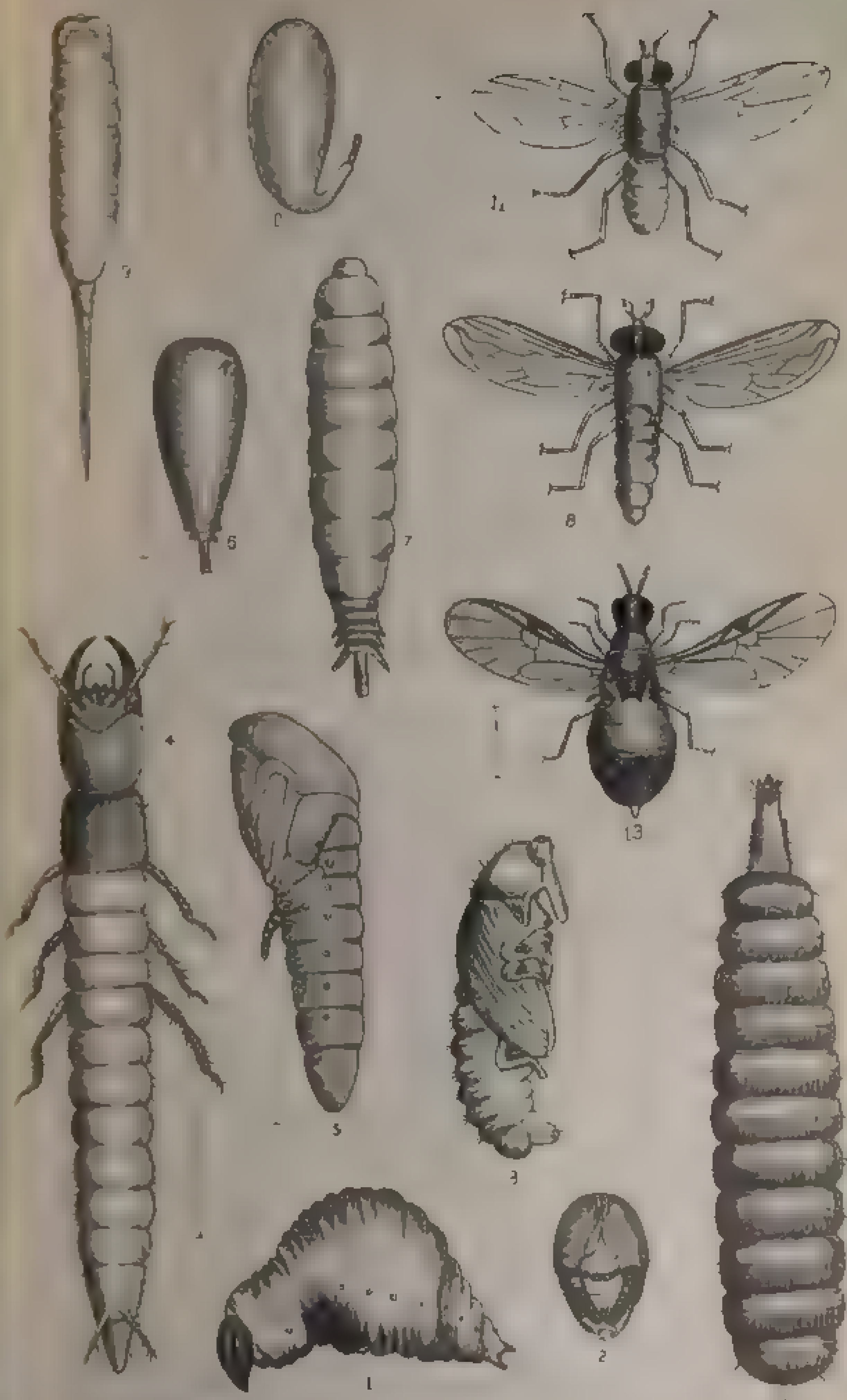

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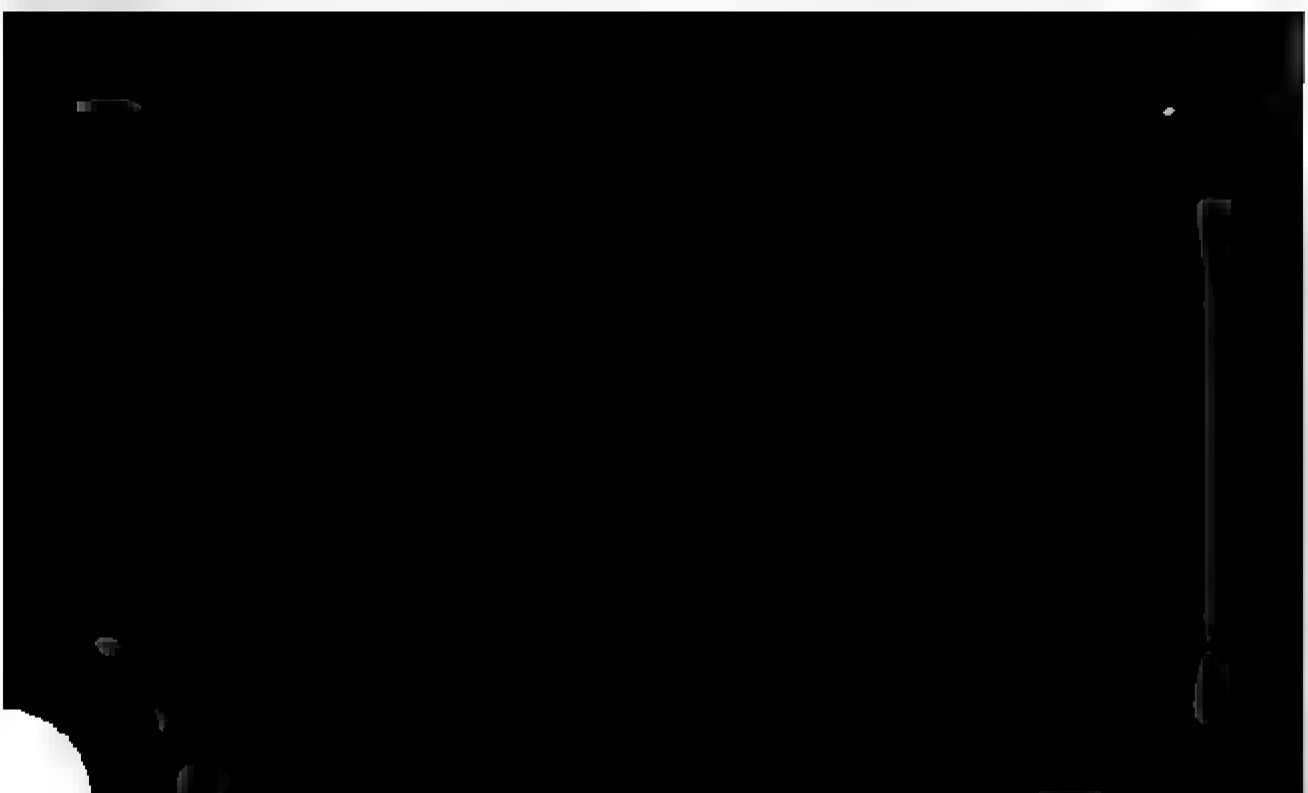

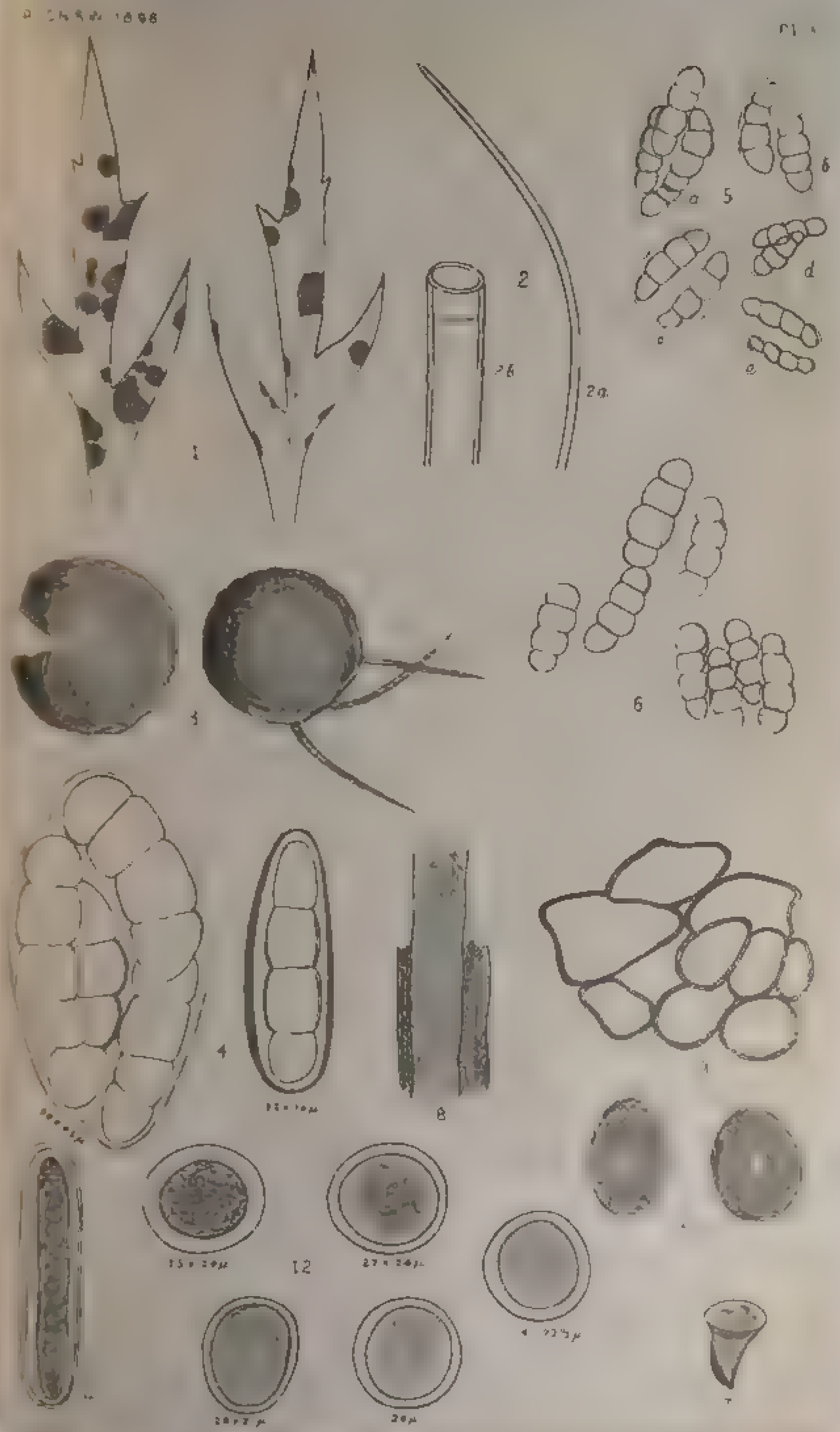

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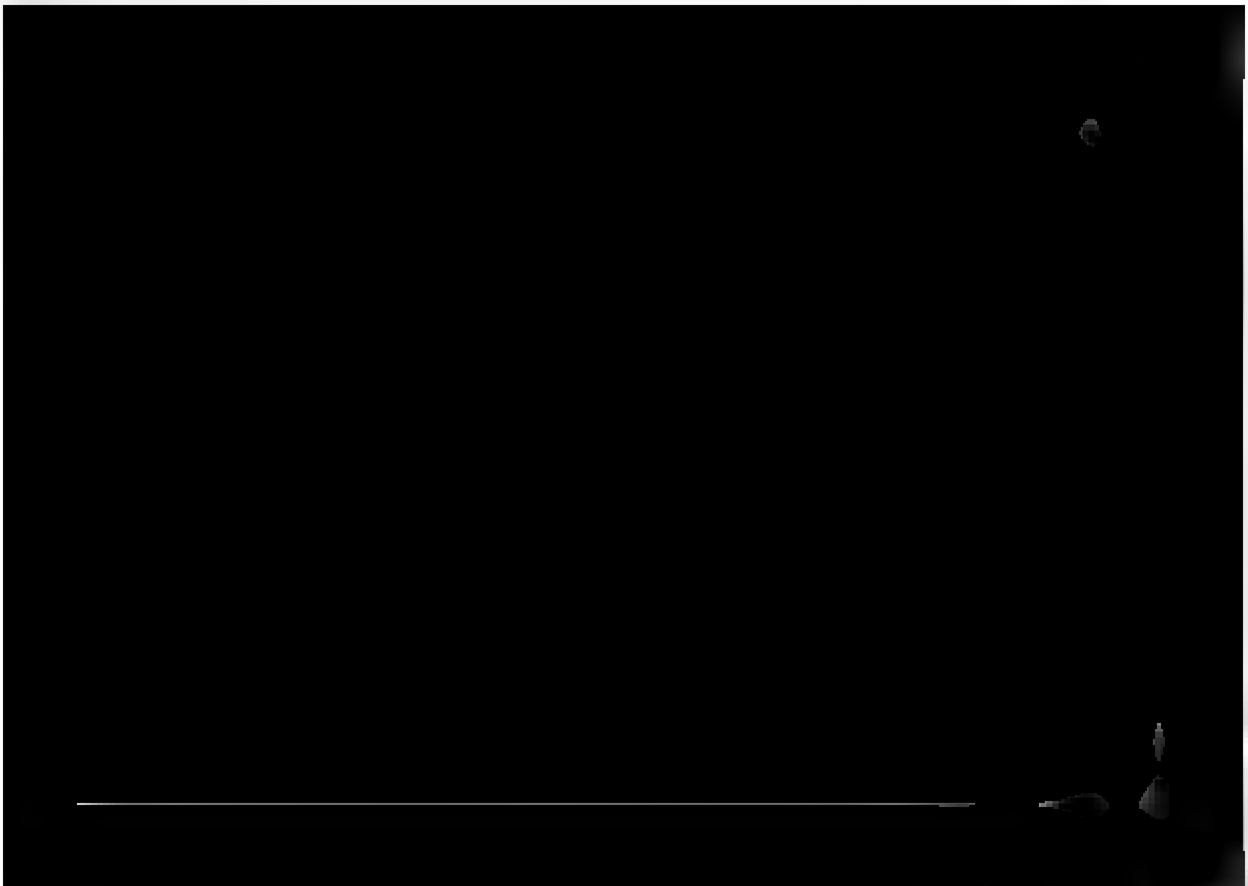

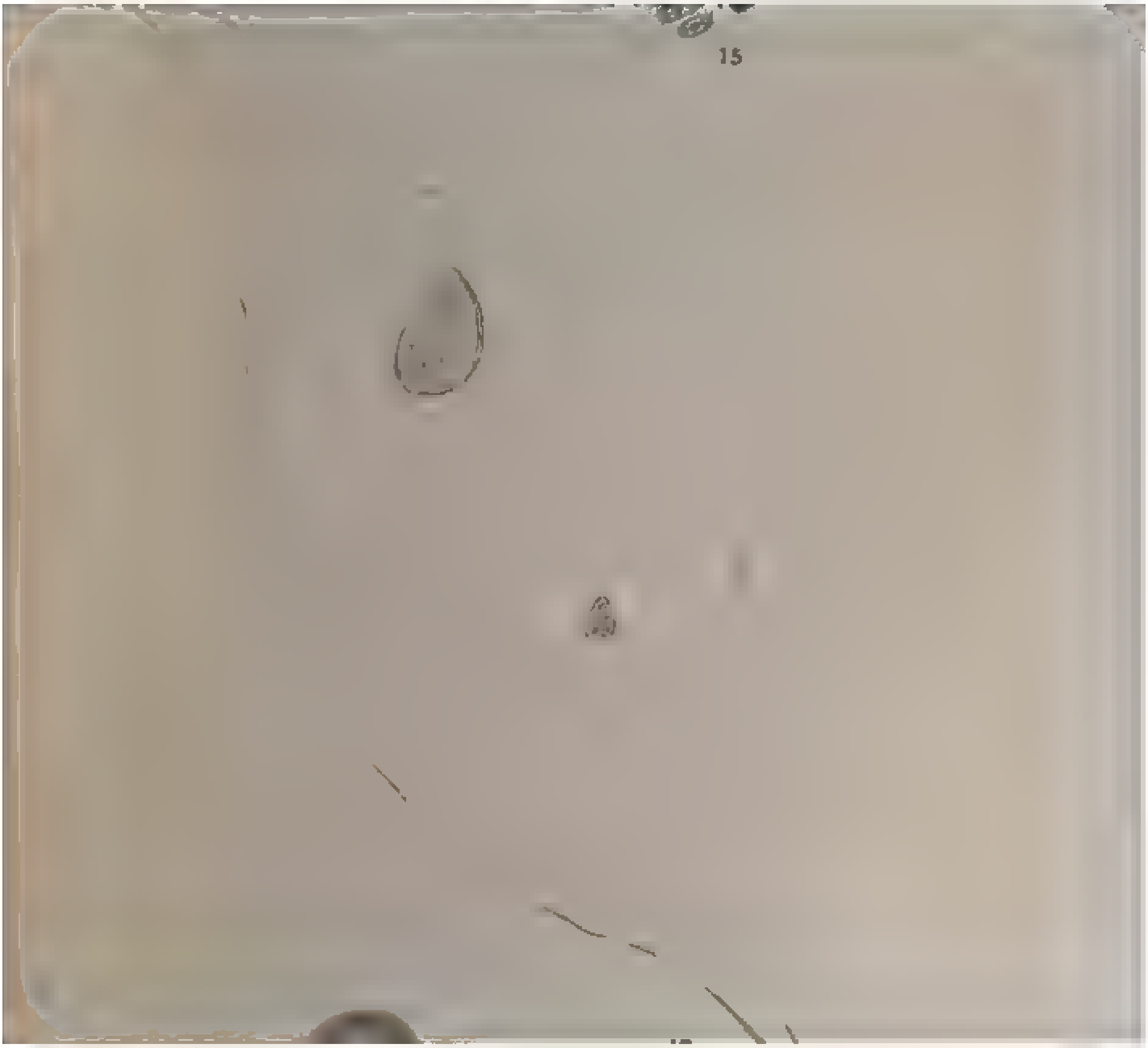
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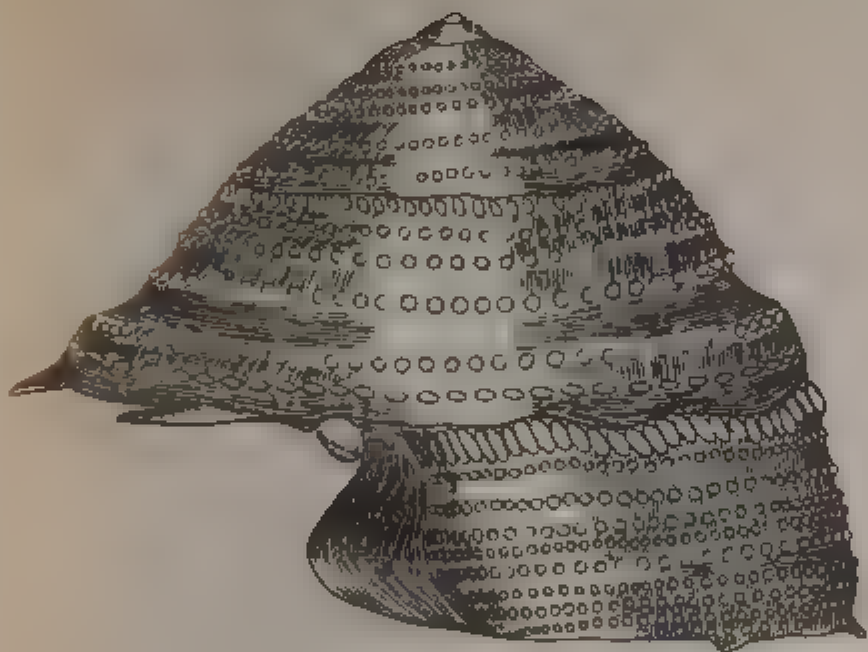

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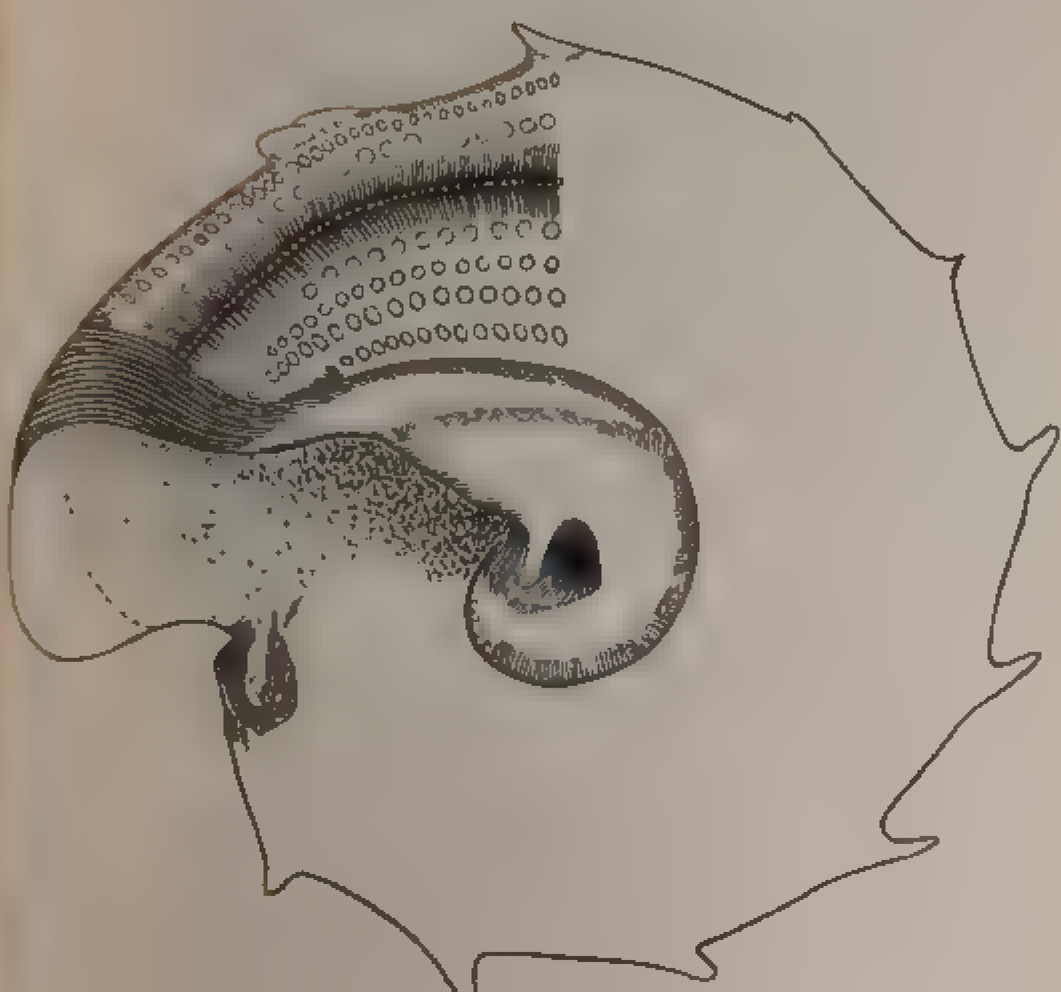

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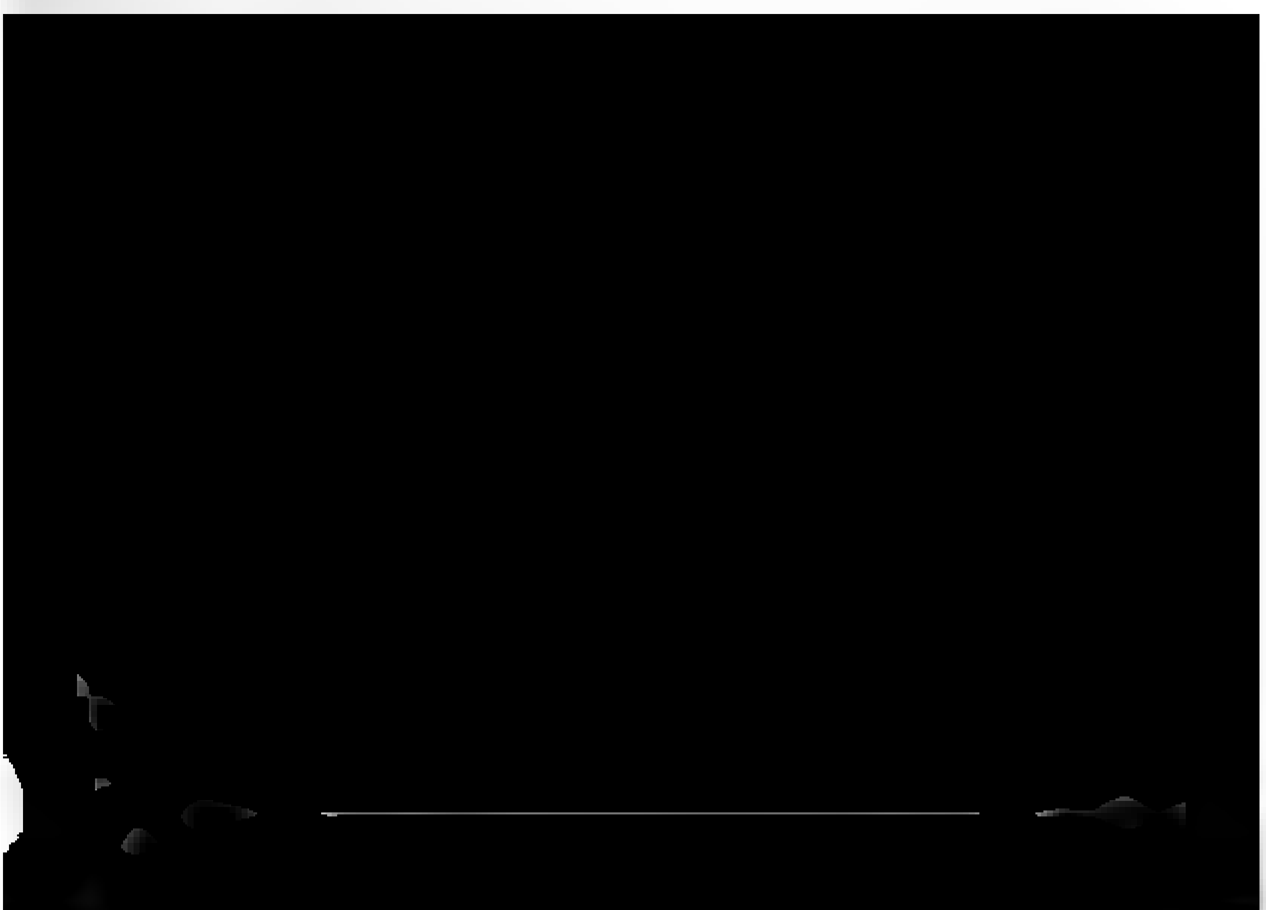
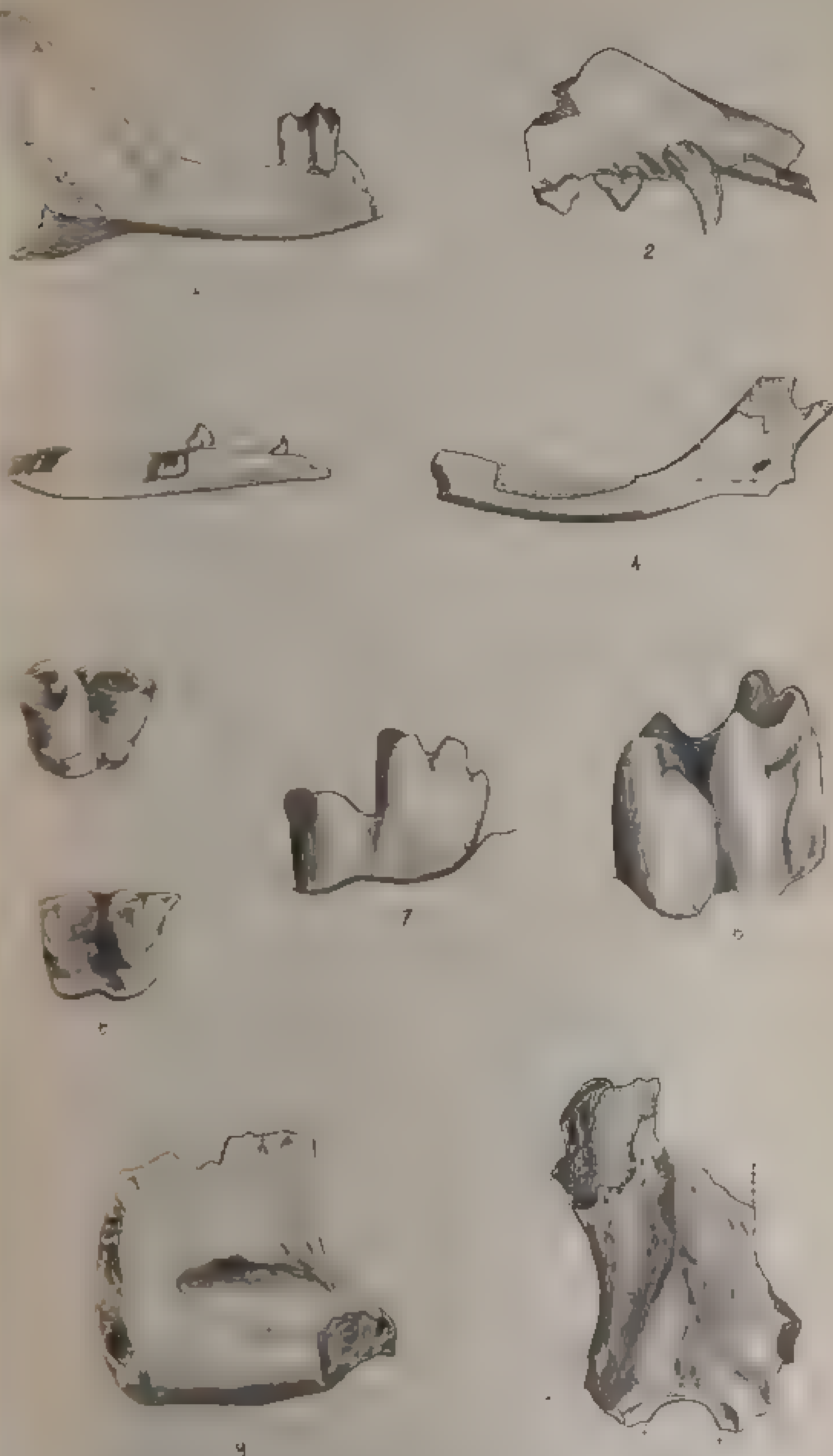


Pl. VIII



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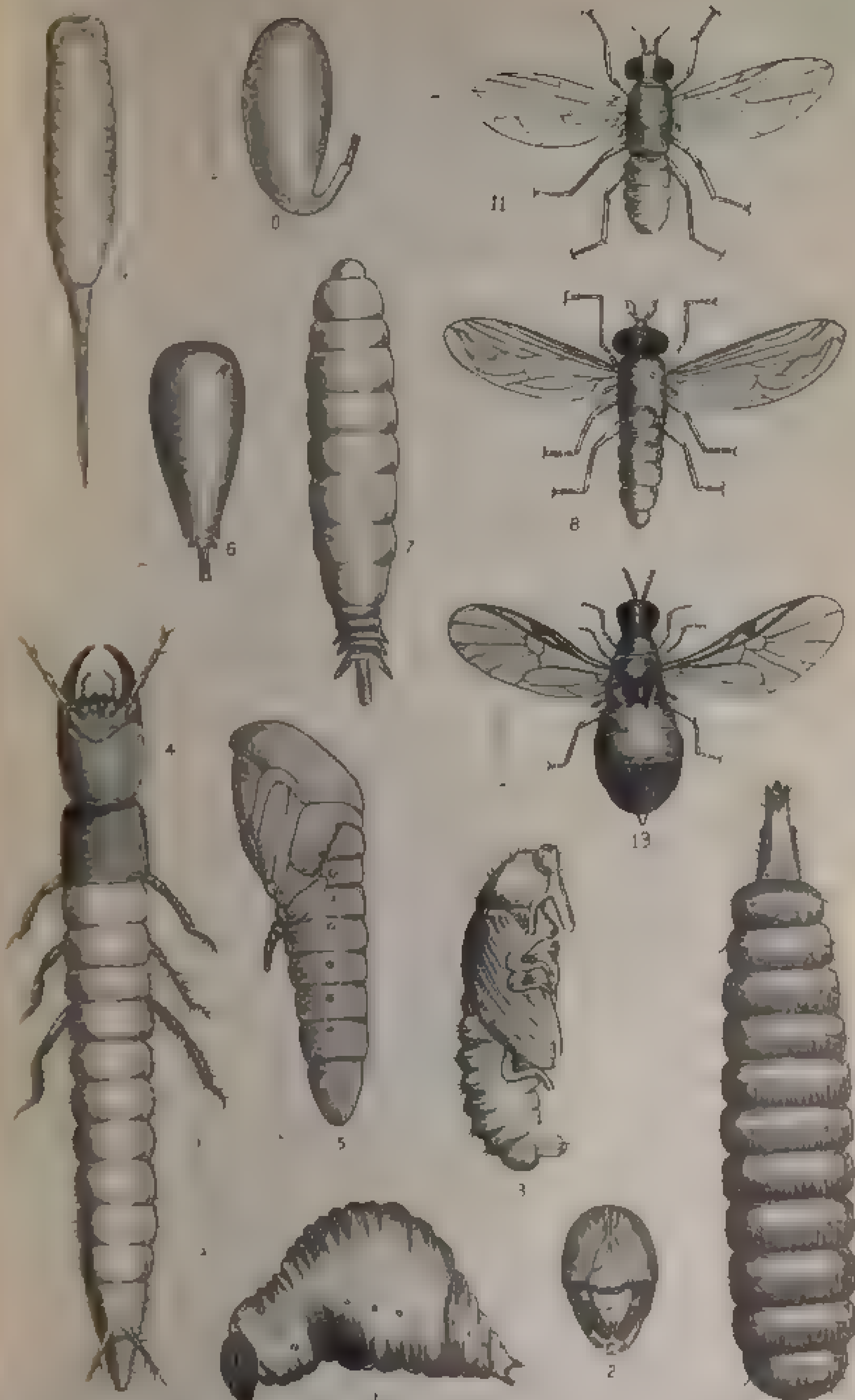

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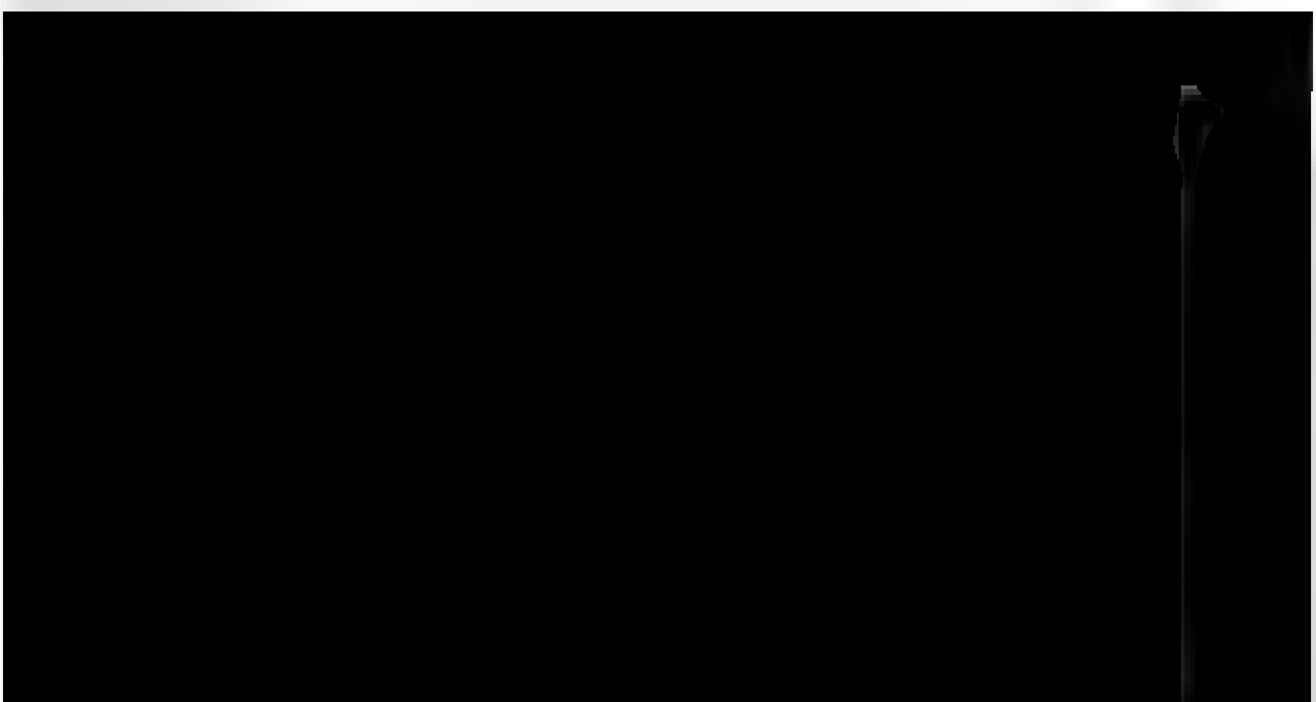
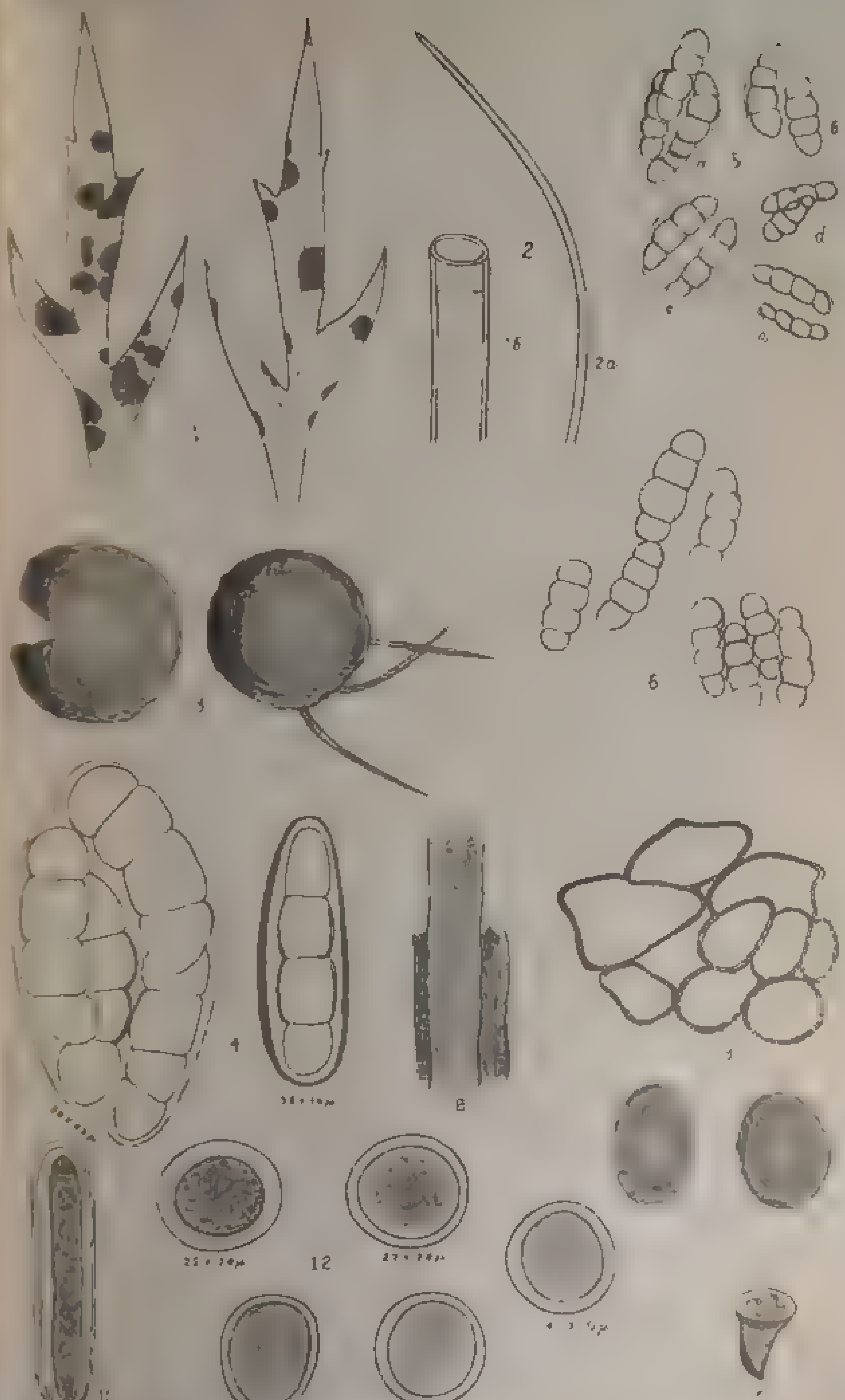
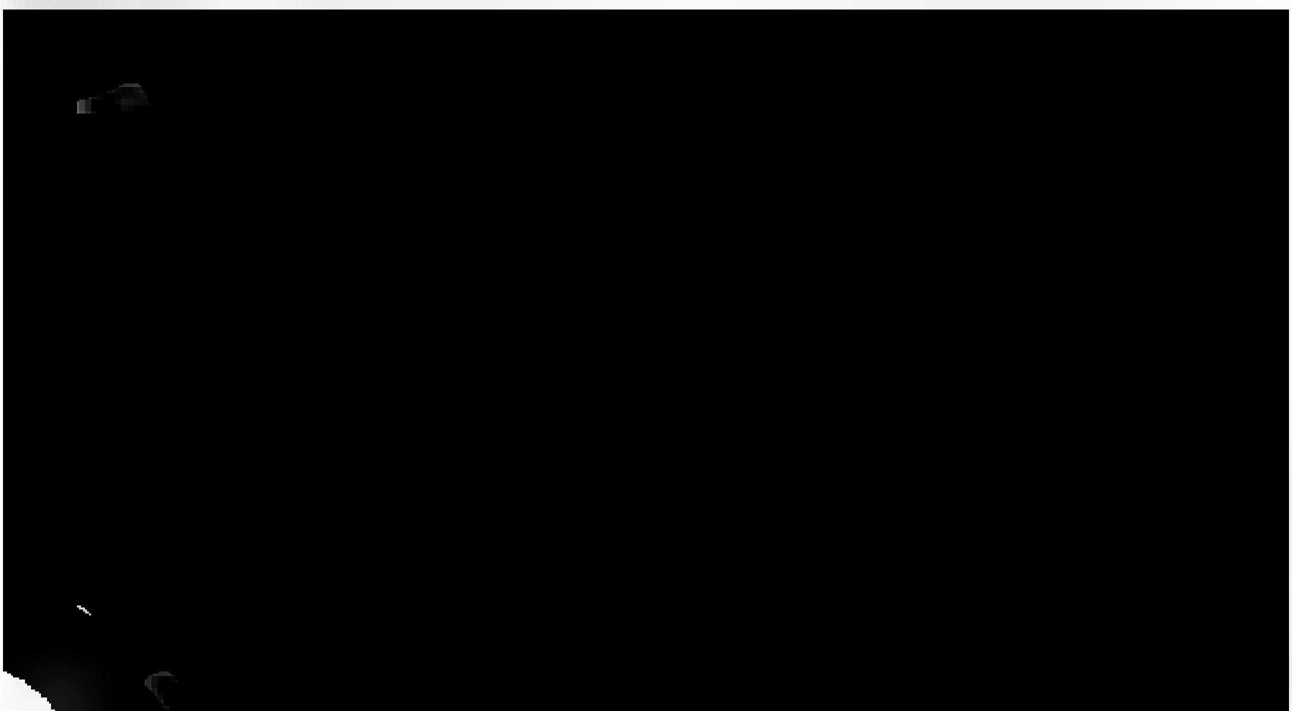
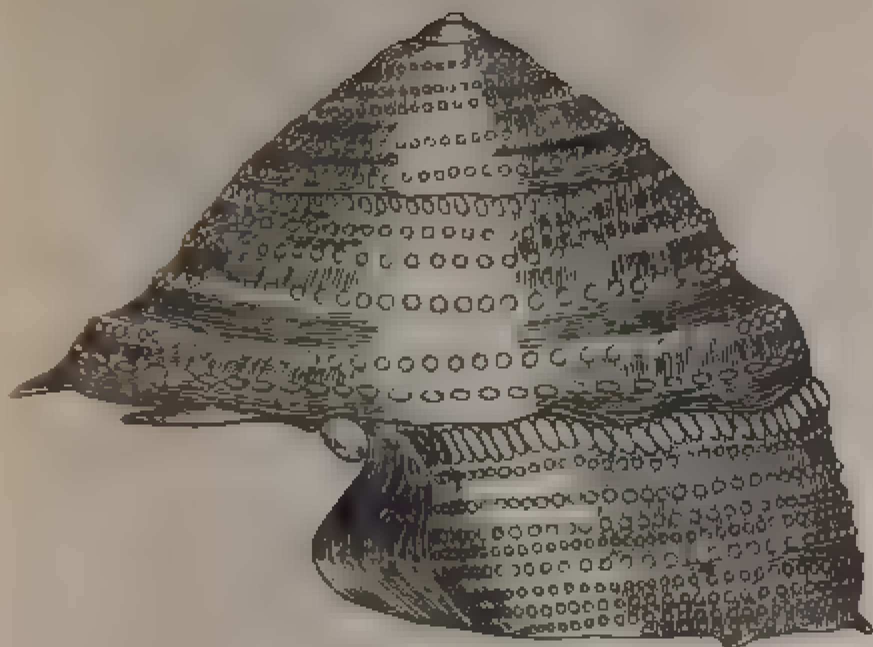




D. McA. del.

PHOMA STENOSPORA.





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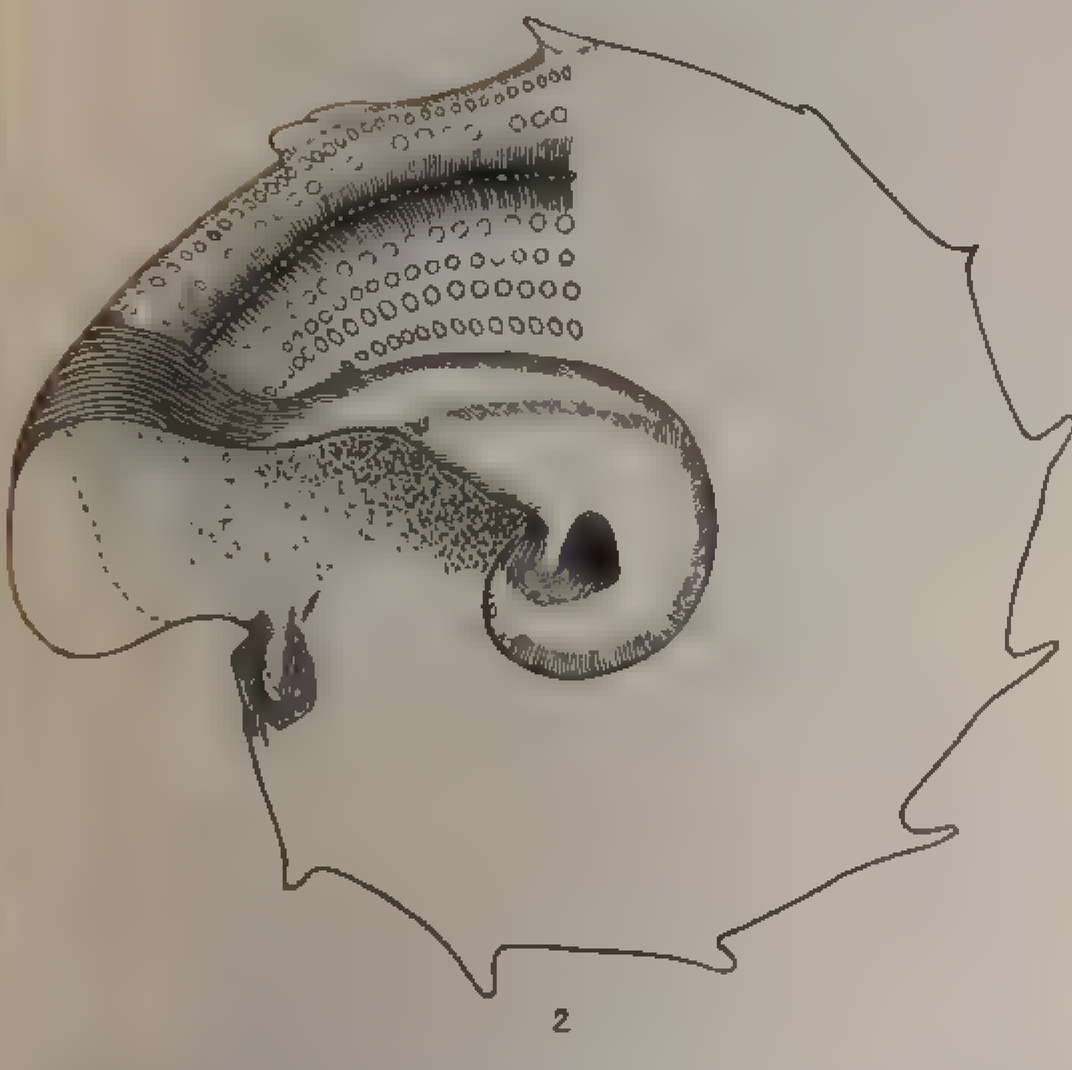

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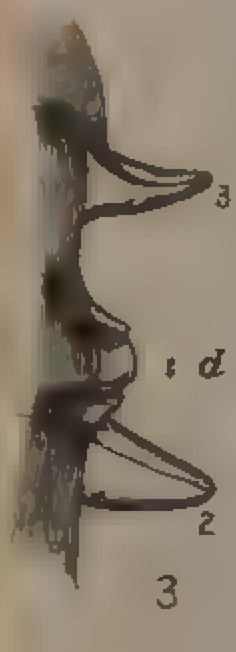

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NOTES AND EXHIBITS.

Mr. Maiden exhibited specimens of the fungi described in Mr. McAlpine's paper.

Mr. Steel exhibited a fine series of beautifully preserved specimens of Peripatus from Australia, Tasmania, and New Zealand.

Mr. Froggatt exhibited living specimens (♂ and ♀) of *Cœlostoma australe*, described in 1890 by Mr. Maskell in the Society's Proceedings (Second Series, v., 280). The male is a very beautiful and rare insect Six were taken, round the stump upon which the female was found, the first examples the exhibitor had ever seen.

Mr. Froggatt also exhibited a number of the larvæ of the Acacia Goat Moth [*Zeuzera* (*Eudoxyla*) *eucalypti*], victims of an attack of a fungoid growth allied to *Cordyceps*, and turned into "vegetable caterpillars," so called. Some of the specimens were cut out of the trunks of Acacias (*A. longifolia*) growing near Manly, in which they were found in the tunnels formed by the larvæ. Others were from larvæ taken alive and kept in breeding boxes; probably they had become infected previously, as after living for months they changed into similar hard masses. The late Mr. Olliff in one of his latest papers in the Agricultural Gazette upon Australian Entomophytes, in describing the hosts of *Cordyceps* says that it attacks only subterranean root-feeding larvæ, and never those of true wood borers, as so often stated by entomologists. The specimens exhibited bear out his statements, for the fungus concerned is a species without the projecting clubbed growth, which would be at a disadvantage in the confined tunnels of a wood-boring caterpillar. It may belong to the genus *Xylostroma*, which is often found in the centre of decaying trees.

The President exhibited a "Cotton-grass Snake" (*Typhlops* sp.) forwarded from Menindie, N.S.W., by Mr. A. G. Little.

WEDNESDAY, 24TH JUNE, 1896.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, June 24th, 1896.

The President, Mr. Henry Deane, M.A., F.L.S., in the Chair.

The President announced that Professor Haswell would be glad to receive and forward contributions to the Huxley Memorial Fund.

The President also announced that Mr. Duncan Carson had presented to the Society his collection of British plants; but as the utilisation of such a collection was hardly within the scope of the Society's operations at present, the Council, with the donor's approval, was prepared to offer the same for distribution among Members desirous of supplementing their British collections.

DONATIONS.

[redacted]

Perak Government Gazette. Vol. ix. Nos. 9-11 (April-May, 1896). *From the Government Secretary.*

Radcliffe Library, Oxford—Catalogue of Books added during the year 1895. *From the Radcliffe Trustees.*

Société Géologique de Belgique—Annales. T. xxiii. 1re Liv. (1895-96). *From the Society.*

K. K. Zoologisch-botanische Gesellschaft in Wien—Verhandlungen. xlvi. Band (1896), 3 Heft. *From the Society.*

Pharmaceutical Journal of Australasia Vol. ix. No. 5 (May, 1896). *From the Editor.*

Bureau of Agriculture, Perth, W.A.—Journal. Vol. iii. Nos. 9 and 12-14 (April-June, 1896). *From the Secretary.*

British Museum (Natural History)—Catalogue of Birds. Vols. xxv. and xxvii. (1895-96): Catalogue of Fossil Fishes. Part iii. (1895): Catalogue of the Fossil Plants of the Wealden. Part ii. (1895): An Introduction to the Study of Rocks (1896): Guide to the British Mycetozoa (1895). *From the Trustees.*

Zoological Society of London—Abstract, April 21st, May 5th: Proceedings, 1895. Part iv: Transactions. Vol. xiv. Part i. (April 1896). *From the Society.*

Royal Society, London—Proceedings. Vol. lix. Nos. 355-356 (March-April, 1896). *From the Society.*

Morphological Laboratory, Cambridge University—Studies. Vol. vi. (1896). *From the Balfour Library.*

Zoologischer Anzeiger. xix. Band. Nos. 501-502 (April-May, 1896). *From the Editor.*

Nederlandsche Entomologische Vereeniging—Tijdschrift. xxvi. Deel. Jaargang 1882-83. Afl. 1-2: xxxvii. Deel. Jaargang 1893-94. Afl. 1-4. *From the Society.*

Société Impériale des Naturalistes de Moscou—Bulletin. Année 1895, No. 4. *From the Society.*

Société des Naturalistes de Kieff—Mémoires. Tome xiii. Livs. 1-2 (1894): Tome xiv. Liv. 1 (1895). *From the Society.*

Société d'Horticulture du Doubs, Besançon—Bulletin. Série Illustrée. No. 4 (April, 1896). *From the Society.*

Zoologische Station zu Neapel—Mittheilungen. xii. Band. 2 Heft (1896). *From the Director.*

Report on the Work of the Horn Scientific Expedition to Central Australia. Part ii. Zoology: Part iii. Geology and Botany. *From W. A. Horn, Esq., per Professor Baldwin Spencer*, M.A.

University of Sydney—Calendar, 1896. *From the Senate.*

L'Académie Royale des Sciences, Stockholm—Oefversigt. lii. Årgången (1895). *From the Academy.*

Victorian Naturalist. Vol. xiii. No. 2 (May, 1896). *From the Field Naturalists' Club of Victoria.*

Birmingham Natural History and Philosophical Society—Proceedings. Vol. ix. Part ii (1895). *From the Society.*

Hooker's Icones Plantarum. Fourth Series. Vol v. Part iii. (May 1896). *From the Bentham Trustees.*

Société Royale de Géographie d'Anvers—Bulletin. Tome xx. 4[me] Fascicule (1896). *From the Society.*

Department of Agriculture, Sydney—Agricultural Gazette. Vol. vii. Part 5 (May, 1896). *From the Hon the Minister for* [redacted]

Natural History Society of Montreal—Canadian Record of Science. Vol. vi. Nos. 3-7 (1894-95). *From the Society.*

Department of Agriculture, Brisbane—Botany Bulletin. No. xiii. (April, 1896). *From the Government Botanist.*

Museum of Comparative Zoology at Harvard College, Cambridge, Mass.—Bulletin. Vol. xxix. No. 2 (March, 1896). *From the Director.*

American Naturalist. Vol. xxx. No. 353 (May, 1896). *From the Editors.*

American Museum of Natural History, New York—Bulletin. Vol. viii. Sig. 5 (pp. 65-80—April, 1896). *From the Museum.*

A NEW FAMILY OF AUSTRALIAN FISHES.

By J. Douglas Ogilby.

The family, of which the following diagnosis is given, is intended to accommodate those forms of percesocoid fishes in which, among other characters which separate them from the *Sphyrænidæ* and *Atherinidæ*, the first dorsal fin is composed of a single pungent and two or more flexible, unarticulated rays, and by the position of the anal fin, which is more elongated and advanced than in the typical Atherinids, and which on account of its anterior insertion pushes forward the position of the anal orifice and of the ventral fins so far that the latter become thoracic, and the family thus makes a distinct advance towards the more typical Acanthopterygians.

To Prof. Kner and Dr. Steindachner, and subsequently to Count Castelnau, the claim of these little fishes to rank as a distinct family has commended itself. Prof. Kner, in 1865, alluded to the expediency of forming a family, *Pseudomugilidæ*, for the reception of certain small fishes, alleged to have been obtained by the collectors of the Novara Expedition at Sydney, and to which he gave the name of *Pseudomugil signifer*; he, however, gave no

its reception, and again in 1875, having formulated yet another new genus under the name of *Neoatherina*, he returns to the subject and proposes "forming on it a family to be called *Neoatherinidæ*," which was also to contain the genus *Atherinosoma*.

We have, therefore, already three different families—*Pseudomugilidæ*, *Zantecladæ*, and *Neoatherinidæ*—proposed for the reception of different genera of these fishes, for not one of which has any diagnosis been even attempted.

To prevent confusion with these older undefined names, it has appeared advisable to me to suggest a new name for the family, though for reasons which I give below I am constrained to make that genus typical, which from its slight specialization is the least suitable; nevertheless, since Dr. Gill has already formulated for certain of these fishes a subfamily of the *Atherinidæ* under the name *Melanotæniinæ*, I do not feel justified in proposing to change his name for the more suitable one of *Rhombatractidæ*.

There are several cogent reasons which point to this course as being the most fitting to pursue under the circumstances. Taking Castelnau's proposed families first:

The use of *Zantecladæ* is precluded, its typical genus *Zantecla* being synonymous with and of later date than *Melanotænia*, and therefore inadmissible; while *Neoatherinidæ*, as well as being the last suggested name and belonging to a less distinctly specialized genus, is formed on a bastard title, the employment of which should be as much as possible deprecated, at any rate so far as the names of families are concerned; besides which it labours under the disability of having been associated by its author with a genus which undoubtedly belongs to the *Atherinidæ* proper.

My choice, therefore, is restricted to the use of *Pseudomugilidæ*, the only one of the three proposed names which in the author's opinion, is entitled to consideration, or to the substitution of *Melanotæniidæ*, and I believe that I am consulting the best interests of science by taking the latter course, for the following reasons:

Pseudomugilidæ, also a bastard name, and therefore open to the same objection as *Neoatherinidæ*, is misleading, since the

genera which are here segregated have little in common with the true Mugilids, but form conjointly a connecting link between the percesocoid and acanthopterygian types; furthermore, *Pseudomugil* is a small and obscure form, not ranking either in distribution or importance with *Melanotænia* or *Rhombatractus*.

I shall now proceed to give a diagnosis of the family, in which I include five genera—*Neoatherina*, *Pseudomugil*, *Rhombatractus*, *Aida*, and *Melanotænia*—which form a very natural group, characterised by the structure of the first dorsal fin, the advanced position of the ventrals, &c

The metropolis of the family appears to be in north-eastern Australia, where no less than four of the genera have their home: thence it has spread northwards into the rivers of south-eastern New Guinea, westwards to Port Darwin and the Victoria River, south-westwards into the central districts of South Australia, and on, in the aberrant *Neoatherina*, to Swan River, and finally southward to the Richmond and Clarence Rivers District of New South Wales, and perhaps even as far as the Nepean watershed.

MELANOTÆNIIDÆ.

Pseudomugilidæ, Kner, Voy. Novara, Fische, p. 275, 1865 (*no definition*).

[redacted]

(seven ?) branchiostegals; pseudobranchiæ present; gill-rakers short. Opercular bones entire; preopercle with a double ridge. Jaws and vomer toothed; palate with or without teeth; tongue smooth. Two separate dorsal fins; the first with a strong, acute spinous ray anteriorly, followed by two or more flexible, often elongate, unarticulated rays; the second with a similar strong spinous and several articulated and branched rays: anal similar to but more developed than the second dorsal: ventrals separate, thoracic, with one spinous and five soft rays: pectorals well developed, rounded: caudal emarginate, the peduncle stout. Body entirely scaly, the scales cycloid or ciliated, smooth; cheeks and opercles scaly; no scaly sheath to the vertical fins; no scaly process at the base of the ventrals; lateral line inconspicuous or absent. Air-vessel present, simple. Pyloric appendages wanting.

Small fishes from the fresh and brackish waters of tropical and subtropical Australia and southern New Guinea.

As indicated on a previous page I propose to associate in this group five genera, the diagnoses of which, so far as the scanty material available to me permits, will be found below, but unfortunately, from lack of specimens, I have not been in a position to personally examine any of these genera except *Rhombatractus*, of which a detailed description is given, the principal characters of the remaining genera being taken from the works of their respective authors.

NEOATHERINA.

Neoatherina, Castelnau, Res. Fish. Austr. p. 31, 1875.

Body subelongate, compressed, with the anterior portion of the back convex; snout pointed, rather projecting; mouth moderate and oblique, the upper jaw the longer. Teeth rather strong, in two series in the upper jaw, long and blunt anteriorly, triangular laterally; in the lower they are very numerous, in pavement form, with an external row of enlarged conical ones; anterior teeth in both jaws directed forwards; palate with several transverse series

of strong teeth.* Two dorsal fins, well separated; the first formed of one rather long spine and of four much longer filamentary rays; the second dorsal long, composed of one spine and eleven rays: anal fin long, with one spine and seventeen strong, spine-like rays: ventrals inserted far behind the base of the pectorals, and very little in advance of the insertion of the first dorsal, with one spine and six† elongate rays: pectorals small, with twelve rays: caudal forked. Scales large, ciliated; cheeks and opercles scaly; lateral line indistinct.

Etymology :—*νέος*, new; *Atherina*.

Type :—*Neoatherina australis*, Castelnau, l c. p. 32.

Distribution :—Swan River, West Australia.

In the increased number of the ventral rays (if correct), the ciliation of the scales and the character of the dentition *Neoatherina* differs from all the other Melanotæniids, while it approaches *Pseudomugil* in the presence of a lateral line; its affinity, however, to the melanotænioid rather than to the atherinoid forms is shown in one character, incidentally alluded to by Castelnau in the following terms: "The small specimen has a more elongate form; the upper profile being much less convex . . ." This character was passed over as of little or no value by that

Pseudomugil.

Pseudomugil, Kner, Voy. Novara, Fische, p. 275, 1865.

Body subelongate, compressed, with convex ventral profile; forehead broad and flat; snout short, with the mouth oblique; a band of acute teeth in both jaws; eyes large; preorbital smooth; two separate dorsal fins, the first with four or five flexible, unarticulated rays; scales large and cycloid, the lateral line little conspicuous. Air-vessel simple. Dorsal and ventral fins with elongate, filiform rays in the male. (*Kner*).

From the description of the only known species we also learn that the lower jaw projects slightly beyond the upper; the maxillary does not reach to the eye, and is almost entirely concealed beneath the preorbital; that the teeth in the jaws are small, acute, directed inwards, and arranged in a narrow band, the outer series being enlarged and almost caninoid, while there are no perceptible teeth on the palate.

The absence of palatine teeth, presence of an inconspicuous lateral line, and similarity in form of the sexes are the only important characters which are available for the separation of this from the succeeding genus, and it is quite possible that, when examples of the two can be compared, the line of demarcation will be found untenable, and *Rhombatractus* will have to merge in the older *Pseudomugil*.

Etymology:—ψεῦδος, false; *Mugil*.

Type:—*Pseudomugil signifer*, Kner.

Distribution:—York Peninsula. In the Voyage Novara it is alleged that the fishes from which Professor Kner's description was drawn up, were collected at Sydney, but this is manifestly erroneous, no member of the family being so far known with certainty to exist on the coastal watershed of our dividing range south of the Richmond and Clarence District, from whence the late Sir William Macleay described a species under the name of *Aristeus lineatus*. The locality here given

is that from which Dr. Günther received his *Atherina signata*, which is said to be identical with Kner's fish.

RHOMBATRACTUS.

Aristeus (not Duvernoy) Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 141.

Rhombatractus, Gill, American Naturalist, 1894, p. 709.

Body rhombofusiform or oblong, strongly compressed, with the dorso-rostral profile more or less emarginate, and the ventral profile convex; head small, the snout broad and depressed; mouth moderate, anterior, with oblique cleft, the lips thin; jaws equal or the lower a little the longer; premaxillaries not protractile, forming the entire dentigerous margin of the upper jaw, broad and projecting horizontally in front, narrow and oblique behind; maxillaries narrow, extending a little beyond the premaxillaries, entirely concealed beneath the preorbital except at the extreme tip. All the bones of the head entire, the preopercle with a double ridge. Gill-membranes separate, entirely free from the isthmus; gill-openings wide; five branchiostegals; pseudobranchiæ present; gill-rakers widely separated, moderate, stiff, and serrulate. Jaws with a band of short, stout, conical teeth, which are more numerous in the lower, the outer series being much enlarged

distance behind the base of the pectorals, with a slender spinous and five soft rays: pectorals rather small, moderately pointed, with 13-15 rays, those in the upper half of the fin the longest, the upper ray simple and somewhat inspissate: caudal fin emarginate, with short deep peduncle. Scales large, cycloid, smooth, not deciduous, the posterior border being more or less truncated, especially on the tail; cheeks, opercles except the outer ridge of the preopercle, and occiput scaly, the rest of the head naked; dorsal and anal fins without a basal scaly sheath; no enlarged scales at the base of the first dorsal, pectoral, or ventral fins, and no scaly process between the latter; lateral line wanting; a series of large open pores from the maxillary symphysis along the lower border of the preorbital, passing upwards in front of and above the eye to the occiput, where it connects with a similar series extending from the mandibulary symphysis below the eye and round the naked outer preopercular surface. Vertebræ 33 to 37 (22 + 15 in *Rhombatractus fluviatilis*). Air-vessel large and simple. Abdominal cavity very large, extending backwards far beyond the vent, the intestines very long and convoluted.

Etymology:—ῥόμβος, rhomb; ἄτρακτος, a spindle; in allusion to its shape.

Type:—*Aristeus fitzroyensis*, Castelnau.

Distribution:—Fresh waters of Australia as far south as the 32nd parallel, and of southern New Guinea.

The sexual differences are strongly marked in these fishes, both as regards the form of the body and the development of the fins. In adult males the depth of the body is much greater than in females of the same age; for instance, in a series of specimens of *Rhombatractus fluviatilis*, collected from a single haul in Yulpa Creek, near Deniliquin, the depth of the males is from $2\frac{1}{2}$ to $2\frac{3}{4}$, of the females from $3\frac{1}{5}$ to $3\frac{1}{4}$ in the total length; this variation is entirely due to the slight development in the latter of the post-occipital convexity, which is so pronounced a character in the males, the rostro-dorsal contour in the females being gently and evenly arched from the extremity of the snout to the caudal peduncle.

The caudal peduncle in the male is a little deeper than long, in the female a little longer than deep.

The development of the dorsal, anal, and ventral fins shows similar sexual distinctions; thus, the flexible spines of the first dorsal, the posterior rays of the second dorsal and of the anal, and the outer rays of the ventral fins are prolonged into filaments in the males, while in females and immature males this character is inconspicuous or absent.

Though not the oldest, this genus is by far the most important of the group, whether as regards its degree of specialization, area of distribution, or number of species.

Up to the year 1878, when Castelnau first described this genus under the name *Aristeus*, all but one of the authors (Richardson, Günther, Kner, and Steindachner), who had written on the fishes which are here collected together in one family, had recognised their affinity to the Atherinids, the exception being Dr. Peters; and though Castelnau himself, first in proposing to separate in a distinct family his closely allied genus *Zantecla* (= *Melanotænia*), which, as he says, "comes near the *Atherinidæ*," definitely gives in his adhesion to this view, and two years subsequently endorsed this recognition by proposing to separate from that family his two new genera, *Atherinosoma* and *Neoatherina*, which he coupled, notwithstanding their manifest differences, as *Neoatherinæ* he

remove Castelnau's genus to its true systematic position, however, as was kindly pointed out to me by Dr. Gill, Steindachner had previously recognised the close relationship of these two genera (Zool. Jahresb. 1879, p. 1061).

Mr. Zietz, the latest writer on the subject, who has followed Steindachner and me in making *Aristeus* synonymous with *Nematocentris*, refrains from enlightening us as to his views of the systematic affinities of this genus; two new species from Central Australia are described by this author, who places them (Horn Exped. Centr. Austr. pp. 178-9) between the Theraponids and the Eleotrine Gobiids, below which *Gobius* itself is ranked, thus leaving so wide a margin for selection that we are left in doubt as to the family in which he is in favour of leaving it, though we would be justified in inferring that he considers Castelnau correct in allying *Aristeus* and, therefore, by his own admission of the identity of the two genera *Nematocentris* with *Eleotris*, since by no possibility could the percesocoid fishes be so placed.

Curiously enough Castelnau himself, in the same pamphlet in which the diagnosis of *Neoatherina* is published, described yet another new genus as *Aida*, of the close relationship of which to *Rhombatractus* I shall have something to say further on, and places it "with considerable doubt in the family of the *Percidae*" that is to say, in that section of Günther's *Percidae*, which we would now call *Apogonidae* or *Cheilodipteridae*; there it is left without comment by Macleay.

Prior, however, to the publication of Castelnau's paper, Dr. Peters had already assigned to his genus *Nematocentris* a position near to the Apogons, although the species on which his diagnosis was formed had been described many years previously by Richardson as *Atherina nigrans*, and holds a place in Günther's Catalogue as *Atherinichthys nigrans*. Kner and Steindachner, however, in the same year point out the affinity existing between *Nematocentris* and the Atherinids, though none of these authors appear to have suspected the identity of their respective species with that of Richardson.

The above remarks will, however, suffice to show how diverse the views of authors have been as to the position which these fishes and their allies are entitled to hold in the ichthyological system.

Aida.

Aida, Castelnau, Res. Fish. Austr. p. 10, 1875.

Body very compressed; upper part of the head unequal; opening of the mouth very oblique, almost perpendicular; opercle and preopercle without teeth or spines, the first with a double edge. Teeth fine, minute, disposed on one line; two very feeble canine teeth in front of the upper jaw; a transverse line of teeth on the palate. Two dorsal fins, the first composed of five spines, the four last prolonged, the second with one spine and thirteen rays, which increase in length backwards: anal with two spines and seventeen rays, formed like the second dorsal: ventrals inserted behind the pectorals and united at their base, formed of one spine and five rays: pectorals placed at about half the height of the body, rather small: caudal bilobed. Scales rather large and entire on their edges, the posterior part of the head and the opercle covered with scales similar to those of the body; no lateral line. *(Castelnau)*.*

Etymology - unknown

lessness which characterises Castelnau's work, may be easily set aside or explained away; the main differences are as follows :—

(i.) *Gill-covers.*—Castelnau writes: "opercle and preopercle without teeth or spines, the first with a double edge." This is probably mere carelessness; by substituting "last" for "first" the description would be quite correct.

(ii.) *Dentition.*—By turning to the foot-note p. 124 my readers will find that I there suggest that certain of the teeth in *Rhombatractus* may be deciduous with age, and it is merely necessary to carry this deciduousness a little further to arrive at a dentition somewhat similar to that described by Castelnau.

(iii.) *Fin rays.*—"Anal with two spines." I do not think it necessary to attach much importance to this character, seeing that Castelnau was possessed of but one specimen from which to draw up his description. It may be taken for granted that in all these small fresh-water fishes the first soft ray is liable to take the form of an additional spine, and it would, of course, be but natural to describe this genus as having two anal spines if the diagnosis was taken from an example having this individual peculiarity.

As an instance of this tendency I may mention that when some years ago a species of *Ambassis* was present in great abundance in the Parramatta and George's Rivers, I noticed that in a number of specimens taken at random almost as many would be found having two rays in front of the second dorsal as those having one, and this increase was always coordinated with a corresponding decrease in the number of soft rays, thus plainly showing that this was not a structural character, but a simple, though common, variation caused by the calcification of the anterior soft ray.

That Castelnau on the one hand was either unaware of or paid no attention to this tendency to acanthination in fresh-water fishes, while on the other hand placing undue prominence on the presence of one or more additional spines, we know from his own writings and from his treatment of *Macquaria australasica*, of

which fish he makes, in a single paper (Proc. Zool. & Acclimat. Soc. Vict. i. 1872, pp. 57 & 61-64), no less than five new species, which he distributes in three different genera, two of which are described as new,* the principal reason given being the disagreement in the number of the dorsal spines; thus, referring to *Dules christyi*, he writes:—"It is so much like *Murrayia cyprinoides* in form that I should have thought it belonged to the same species had it not been for the difference in the number of the spines of the first dorsal." And in the diagnosis of *Riverina* the following passage occurs —"This genus is very nearly allied by its form to *Murrayia*, but the dorsal has twelve spines." *Murrayia* has eleven spines and twelve rays, *Riverina* twelve spines and eleven rays.

(iv). *Lepidosis.*—Of the gill-covers only the opercle, according to Castelnau, is scaly; but even here by the simple substitution of "opercles" for "opercle" the diagnosis would be sufficiently close for that author.

I think, therefore, that it is quite possible that when Castelnau penned his description of *Aida* he had a specimen of *Rhombatractus* before him, and in any case, until I am satisfied that the differences relied on are constant and are supported by other structural characters, I am content to consider *Aida* a true Melanotæniid.

Body fusiform, little compressed, with the dorso-rostral profile slightly curved; snout short, depressed, prominent; mouth small, with horizontal cleft. Opercle spineless; preopercle with a double ridge. Gills four; six branchiostegals; pseudobranchiæ present. Jaws, vomer, and palatines with a band of villiform teeth, the outer series in the former being enlarged, conical, and curved. Two separate dorsal fins, the first with one stout and four or five slender, flexible rays, the second longer, with one spine and nine to twelve articulated and branched rays: anal long, with a single stout spine: ventrals thoracic. Scales of moderate size, cycloid, with the margins feebly crenulated. No lateral line. Pyloric appendages in small number. Air-vessel simple.

Etymology:—μέλας, black; ταινία, a band.

Type:—*Melanotænia nigrans*, Gill, = *Atherina nigrans*, Richardson.

Distribution:—Fresh and brackish waters of northern and eastern Australia, extending southwards at least as far as the Richmond River District, and possibly further since, after describing *Aristeus fluviatilis*, Castelnau remarks:—"I have two specimens of this fish, one, two and a half inches long. It comes from the Murrumbidgee . . . . the other was found by Mr. Duboulay in Rope's Creek, and is three and a half inches long. It has a very feebly marked black longitudinal stripe on each side." This latter specimen is probably a *Melanotænia*, and the locality given would bring the range of that genus as far south as the metropolitan district.

It is much to be regretted that owing to the uncertainty which prevails as to the correct name of the genus which I have called *Rhombatractus* in this paper, I have been obliged to adopt as the sponsor of the family a genus which is distinctly less specialized and, in its little compressed, non-ventradiform body more closely approaches to exotic forms than the others. If I could have satisfied myself that future investigations would justify the separation of *Rhombatractus* from *Pseudomugil* and *Aida*, I should

certainly have preferred to name the family *Rhombatractidæ*, that genus being the most highly specialized and most widely diffused of all the forms at present known.

In reference to the position which this family is entitled to hold in the system, I am unable to agree with those authors who would place it between the *Atherinidæ* and the *Mugilidæ*, much less with those who would associate it with the *Eleotrinæ* or the *Apogonidæ;* but though the position of these fishes near *Apogon* is untenable, it cannot be denied that there is considerable external resemblance between them and some Ambassids: in *Nannoperca*,* for instance, we find the same posterior insertion of the ventrals, reduced number of branchiostegal rays (six as in the Ambassids, not seven as in the Apogonids), absence or irregularity of the lateral line, and concavity of the dorso-rostral contour.

That, however, its affinities are distinctly percesocoid I believe that no one, who is acquainted with one or more of the various forms, and who has more than a superficial knowledge of fishes in general, will deny, and it is only, therefore, with regard to the degree of affinity which exists between it and the other Percesocids that I am at issue with those scientists who would make it a link between the Gray Mullets and the Atherines.

The forward position of the ventral fins, which is so character-

[redacted]

Suborder—SYNENTOGNATHI.*

Suborder—PERCESOCES.

Family—MUGILIDÆ.

„ ATHERINIDÆ.

„ SPHYRÆNIDÆ.

„ MELANOTÆNIIDÆ.

Suborder—ACANTHOPTERYGII.

Appended is a list of the Melanotæniids described up to the present time :—

1. *Neoatherina australis*, Castelnau, Res. Fish. Austr. p. 32, 1875. Swan River, West Australia.

2. *Pseudomugil signifer*, Kner, Voy. Novara, Fische, p. 275, 1865. Sydney, New South Wales.

3. *P. signata*; = *Atherina signata*, Günther, Ann. & Mag. Nat. Hist. (3) xx. 1867, p. 64. Cape York, Queensland.

4. *Rhombatractus fitzroyensis*; = *Aristeus fitzroyensis*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 141. Fitzroy River, Queensland.

5. *R. fluviatilis*; = *Aristeus fluviatilis*, Castelnau, l.c. Murrumbidgee River, New South Wales.

6. *R. rufescens*; = *Aristeus rufescens*, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 625 [1881]. Rivers of Northern Queensland.

7. *R. lineatus*, = *Aristeus lineatus*, Macleay, l.c. p. 626. Richmond River, New South Wales.

8. *R. cavifrons*; = *Aristeus cavifrons*, Macleay, l.c. vii. 1882, p. 70. Palmer River, Queensland.

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* Possibly the Lophobranchiate fishes should intervene between the Hemirrhamphids and the Percesocids.

9. *R. goldiei*; = *Aristeus goldiei*, Macleay, l.c. viii. 1883, p. 269. Goldie River, New Guinea.

10. *R. perperosus*; = *Aristeus perperosus*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 694.

11. *R. novæ-guineæ*, = *Nematocentris novæ-guineæ*, Ramsay & Ogilby, Proc. Linn. Soc. N.S. Wales (2) i. 1886, p. 13. Strickland River, New Guinea.

12. *R. rubrostriatus*; = *Nematocentris rubrostriatus*, Ramsay & Ogilby, l.c. p. 14. Strickland River, New Guinea.

13. *R. loriæ*; = *Aristeus loriæ*, Perugia, Ann. Mus. Genov (2) xiv. 1894, p 519.

14. *R. tatei*; = *Nematocentris tatei*, Zietz, Rep. Horn Exped. Centr. Austr. Zool. p. 178, f. 2, 1896. Finke River, South Australia.

15. *R. winneckei*, = *Nematocentris winneckei*, Zietz, l.c p. 179, f. 3. Finke River, South Australia.

16. *Aida inornata*, Castelnau, Res. Fish. Austr. p. 10, 1875. Gulf of Carpentaria.

17. *Melanotænia nigrans*; = *Atherina nigrans*, Richardson, Ann. & Mag. Nat. Hist. xi. 1843, p. 180. Rivers of North Australia. As before remarked (p. 131) the same species may range nearly as far southward as Sydney, but much confusion exists as to the members of this genus. Dr. Gunther apparently is content to consider the four species identical, but I think that any such conclusion

19. *M. nigrofasciata*; = *Strabo nigrofasciatus*, Kner & Steindachner, Sitzb. Ak. Wiss. Wien, liv. 1866, pp. 373, 395, pl. iii. f. 10, [1867], and lv. 1867, p. 16. Brisbane and Fitzroy Rivers, Queensland.

20. *M. pusilla*; = *Zantecla pusilla*, Castelnau, Proc Zool. & Acclimat. Soc. Vict. 1873, ii. p. 88. Port Darwin, North-West Australia.

In the above list I have made no attempt to indicate the degree of affinity between any of these species, but it is generally conceded that *Atherina signata*, Günther, is identical with *Pseudomugil signifer*, and that *Nematocentris splendida*, Peters, and *Strabo nigrofasciatus*, Kner & Steindachner, cannot be separated specifically from *Melanotænia nigrans*; *Zantecla pusilla*, Castelnau, is a good species in my opinion.

It is, however, improbable that all the twelve described species of *Rhombatractus* are tenable, but I trust soon to be in a position, with the cooperation of other scientific societies and of individual students, to publish in this Journal a monograph of the family with original descriptions of all the species.

DESCRIPTIONS OF TWO NEW GENERA AND SPECIES OF AUSTRALIAN FISHES.

By J. Douglas Ogilby.

Macrurrhynchus, gen.nov.

Body elongate, compressed; head moderate, the snout somewha pointed, conical, deep, projecting, convex above; mouth small prominent, subinferior, with transverse cleft; lips thin; denti gerous portion of the upper jaw slightly curved, of the lowe semicircular; cleft of mouth extending to beneath the middle o the eye; nostrils superior, the anterior pair rather close together about as far from the eye as from the tip of the snout; the posterior pair more widely separated, midway between the eye and the anterior nostril; no nasal nor orbital tentacles, eyes lateral; interorbital region moderate and flat. Gill-openings reduced to a small foramen in front of the upper angle of the base of the pectoral. Teeth in a single series in both jaws, fixed those of the upper well developed, laterally compressed, of rathe unequal length; with the tips truncated and slightly bent back wards; of the lower smaller, more slender and crowded, and

Etymology:—*Macrurus*; *ῥύγχος*, snout; in allusion to the form of the snout, which bears a marked resemblance to that of many of the *Macruridæ*, such for example as *Cœlorhynchus australis*.

Distribution:—Western Pacific.

I would gladly have given to this genus the name *Aspidontus* of G. Cuvier, but that I am unaware whether any diagnosis of that genus was ever published. Dr. Günther apparently did not know of any such definition, and merely quotes Quoy & Gaimard for the name, making it synonymous with Rüppell's *Petroscirtes*.

MACRURRHYNCHUS MAROUBRÆ, sp.nov.

D. xii 30. A. 30.

Body of nearly equal depth throughout. Length of head $4\frac{2}{5}$, depth of body $6\frac{3}{4}$ in the total length; depth of head $1\frac{3}{4}$, width of head 2, of the flat interorbital region $3\frac{2}{3}$, diameter of the eye 4 in the length of the head; snout projecting, macruriform, with the profile convex, as long as the eye, the lower surface linear and oblique, as long as the upper. The posterior angle of the mouth extends to the vertical from the middle of the eye, the naked portion of the retangular cleft on each side as long as the entire dentigerous portion and $4\frac{1}{2}$ in the length of the head. Dorsal fin commencing immediately behind the posterior border of the preopercle, the distance between its origin and the extremity of the snout being five-sixths of the length of the head; the rays are of about the same length throughout, the middle ones being a little the longer, $2\frac{1}{4}$ in the length of the head: the anal originates a little behind the vertical from the last spinous ray of the dorsal and is considerably lower than that fin: the ventrals are composed of slender rays, three-sevenths of the length of the head: the pectoral fins are small, rounded, and symmetrical, their length five-eighths of that of the head: caudal fin small, slightly and evenly emarginate, $6\frac{1}{4}$ in the total length, its peduncle short and stout, with a depth of a half of that of the body.

Back olive green, lower half of the sides and the abdominal region silvery white washed with rose-colour; these tints are sharply defined, but from the lower border of the green numerous short vertical bars, as wide as the interspaces, extending downwards encroach on the sides; a narrow bright blue stripe extends backwards from the snout, above and in contact with the eye, along the side almost as far as the base of the caudal fin, about equally dividing the darker ground colour; they meet on the upper lip, where also they connect with a similar band which traverses the side of the snout, immediately below the rostral ridge, and is continued backwards below the eye to the opercles; a third stripe runs along the median line of the head to the dorsal where it is broadly forked, the branches being short; extremity of the snout orange on the lower surface; dorsal and anal fins silvery, with several broad dark vertical bands composed of numerous, closely set, blackish dots, and with a narrow marginal band of the same; ventral, pectoral, and caudal fins uniform grayish silvery, the latter with a dark band formed like those of the dorsal along the middle ray.

A single specimen was washed ashore during the month of May, on the beach at Maroubra, and was secured by Mr. Whitelegge, by whom it was presented to the Australian Museum; its length is 52 millimeters

[redacted]

behind the premaxillary so as to form a strong, compressed, odontoid process. Nostrils lateral, widely separated, the anterior pair smaller than the posterior, surrounded by a skinny, vesicular lip. Eyes small and lateral, completely covered by similar skin. Opercles covered by a continuous skin; opercle with two strong spines, the upper of which pierces the skin. Gill-openings of moderate width, extending forwards to below the posterior border of the preopercle; isthmus wide; seven branchiostegals; no pseudobranchiæ; gill-rakers reduced to small, serrulate tubercles. Upper jaw with a band of villiform teeth and a single small, curved, canine-like tooth on each side of the symphysis; lower jaw with a narrow band of villiform teeth anteriorly, the inner series much enlarged and continued backwards along the sides in the form of a row of widely separated, curved, canine-like teeth; vomer with an angular series of small, acute, conical teeth, the posterior tooth on each side greatly enlarged; palatine teeth in a triangular patch anteriorly, small and conical, with a single central and three posterior basal enlarged ones; pterygoids and tongue smooth. Anterior dorsal fin represented by a single spinous tubercle which does not pierce the skin; dorsal and anal fins low, separated from the caudal by a distinct interspace: ventral fins close together, inserted behind the isthmus, reduced to a slender filament, which is composed of two intimately connected rays: pectorals moderately developed, pointed, composed of twenty slender branched rays: tail diphycercal, the caudal fin narrow and pointed. Scales small, deeply embedded, widely separated; head, except the snout, with scattered scales; vertical fins for the most part covered with skin, which is scaly like the body. A series of large pores along the outer border of the snout and preorbital, and a pair of similar pores at the angle of the preopercle; lateral line inconspicuous.

Etymology:—δέρμα, skin; ὄψις, eye.

Distribution:—Coast of New South Wales.

Apparently the dorsal tubercle represents the rudiments of a first dorsal fin, and its presence would, therefore, necessitate the removal of the genus from the *Brotulidæ* to the *Gadidæ*, a course

which I am very unwilling to take since in all other characters it is a true Brotulid; in fact its affinity to *Dinematichthys* is so close that its disassociation with that genus would be out of the question, the dentition and the form of the maxillary being the only prominent external differential characters. I have not had access to Dr Bleeker's paper diagnostic of *Dinematichthys*, and am, therefore, unaware as to whether or not he notices any such rudimentary first dorsal in that genus; certainly no other authors, such as Drs. Ayres, Günther, Gill, and Jordan, who have made personal examinations of the various species, have mentioned it. It would be interesting if some scientist, possessed of a series of that genus, were to investigate the matter with a view to detecting the existence of the same structure in *Dinematichthys*, since, should it be so discovered, the two genera would, I presume, have to be removed from the *Brotulidæ*, or at least one of the structural characters which separate that family from the *Gadidæ* would have to be modified. Perhaps Dr Jordan would examine one of his examples of *Dinematichthys ventralis*, and let us know whether any such rudiment is present.

Dermatopsis macrodon, sp.nov.

D. 78. A. 52.

Body elongate and compressed; the tail very strongly so, its posterior portion tæniiform. Head moderate, with the cheeks and opercles rather swollen, its length $4\frac{1}{2}$, the depth of the body $6\frac{2}{3}$ in the total length; depth of the head $1\frac{3}{5}$, width of the head $1\frac{4}{7}$, of the interorbital region $5\frac{3}{4}$, diameter of the eye 7 in the

[illegible] so as to form a strong, compressed, tooth-like process, [illegible] curved base of which the rounded distal extremity of [illegible] maxillary fits; behind this process the maxillary bone [illegible] and even are, of equal width throughout, the [illegible] and directed slightly upwards; the maxillary [illegible] about one diameter behind the eye, and its length [illegible] to tip is 1¼ in that of the head; the lower jaw is a little [illegible] than the upper, and is provided with an inferior low [illegible] lip which extends entirely across its anterior border and [illegible] at the edge; the mandibular bone reaches as far [illegible] the maxillary, along the inner surface of which it lies. [illegible] anterior nostrils are small and circular, and are situated [illegible] together on the edge of the maxillary and directly in [illegible] the posterior pair, which is much larger and subtriangular, [illegible] in advance of the eye; both are surrounded [illegible] laterally in advance of the eye; both are surrounded [illegible] vesicular lip, which entirely conceals the [illegible] bones, skinny, entirely covered by loose skin. Opercle [illegible] Eye very small, entirely covered by loose skin. Opercle [illegible] pair of stout sharp spines, the upper one running in a [illegible] direction below its upper border, the lower rising from [illegible] directed downwards and a little backwards, both [illegible] concealed beneath the loose skin, which is continuous [illegible] with the exception of the extreme tip of the [illegible] just pierces the skin. Twelve rudimentary, [illegible] each of them crowned with a few short [illegible] on the lower branch of the anterior arch. The band [illegible] on the premaxillaries is broad in front, but [illegible] in width on the sides about midway along [illegible] on each side of the symphysis anteriorly is a [illegible] canine-like tooth; the mandibulary band is [illegible] than that of the premaxillaries, and does not [illegible] laterally, there are no enlarged teeth anteriorly at [illegible] but the inner series is considerably enlarged, [illegible] the lateral dentition consists of seven or [illegible] very strong, widely separated, caniniform teeth, which are [illegible] backwards and inwards, the largest teeth being about the middle of the series; there is an angular ridge on the head of the

vomer, which is armed with a single series of acute, separated teeth, those at the apex and along the sides moderate size, while the posterior tooth on each limb is si the largest mandibulary teeth, and is directed backwar slightly outwards; palatine teeth in an acutely triangula with the apex pointing forwards, and consisting of small teeth, with a central and three basal enlarged and conic The dorsal tubercle is situated immediately behind the bas pectoral, it does not pierce the skin, but is distinctly per to the finger-nail; the origin of the dorsal fin is above the of the pectoral, and rather more than a diameter of behind the dorsal tubercle; its distance from the extremit snout is $3\frac{2}{3}$ in the total length; the rays are very slender little branched, of almost equal length throughout, thos are inserted somewhat behind the middle of the fin being the longest and about one-third of the length of the he anal originates beneath the commencement of the middle the dorsal, and is in all respects similar to that fin; the between its origin and the tip of the snout is as lon distance from the base of the caudal fin; ventral inserted the hinder margin of the preopercle, not quite so long, the half as long as the head; caudal fin truncate at the b quite as long as the pectoral, with thirteen rays.

ON THE AUSTRALIAN *CLIVINIDES* (FAM. *CARABIDÆ*).

(REVISION OF THE AUSTRALIAN SPECIES OF THE GENUS *CLIVINA* WITH THE DESCRIPTION OF A NEW GENUS, *CLIVINARCHUS*).

BY THOMAS G. SLOANE.

The *Clivinides* form a division of the tribe *Scaritini* of world-wide distribution, but found most plentifully in the warmer portions of the globe; they are very plentiful in Australia.

Following Dr. G. H. Horn's classification of the *Carabidæ*, their position will be as follows:—

Family CARABIDÆ.

Sub-Family CARABINÆ.

Tribe SCARITINI.

The *Scaritini* may be divided into two main divisions thus:—

Mentum broad and concealing at sides base of maxillæ............ *Scaritides*.
Base of maxillæ not covered by mentum.................................. *Clivinides*.

CLIVINIDES.

As represented in the Australian fauna, the *Clivinides* comprise the genera *Dyschirius*, *Clivina*, *Clivinarchus* and *Steganomma*. For the present I have to pass over *Steganomma* which is founded on a unique species, *S. porcatum*, Macl., in the Macleay Museum, Sydney; it is very closely allied to *Clivina*.

For the purposes of the Australian fauna the genera *Dyschirius*, *Clivina* and *Clivinarchus* may be tabulated thus:—

Prothorax globose.. *Dyschirius*.
Prothorax not globose.
  Mesosternal episterna strongly impressed on each side of
    peduncle.. *Clivina*.
  Peduncle without lateral impressions.......................... *Clivinarchus*.

Genus Clivina.*

Scolyptus, Putzeys (in part): *Ceratoglossa*, Macleay

The following features of universal application in the genus *Clivina* are extracted from Dr Horn's definition of the tribe *Scaritini*.†

Eyes not distant from mouth. Head with two supra-orbital setæ Ligula small and prolonged, bisetose at tip, paraglossæ slender. Palpi with penultimate joint bisetose in front.‡ Thorax with two lateral punctures Body pedunculate, scutellum not visible between elytra Sides of elytra narrowly inflexed, margin entire Metasternal epimera distinct. Posterior coxæ contiguous. Legs stout, the anterior femora especially stout.

To the universal characters given above I would add for the Australian species the following:—

Labrum usually truncate (sometimes the middle lightly advanced), gently declivous to anterior margin; five (rarely) or seven (normally) setigerous punctures above anterior declivity—the lateral puncture on each side larger than the others and the seta rising from it longer than the other setæ and erect (in species with only five setæ the one next to the lateral is wanting); anterior angles rounded, ciliate. Mentum emarginate with a wide median tooth. Clypeus with a seta on each side. Vertex with a ridge on each

[illegible] of Putzeys); a sulcus on inner side of each of the facial [illegible] (*facial sulcus*). Throat and temples normally rugulose; gular sutures wide apart, a short oblique ridge *(gular cicatrix)* extending inwards on each side of base of neck and dividing the gular and temporal regions. Prothorax and disc canaliculate, and normally with a transverse arcuate impression (*anterior line*) near anterior margin; a deep channel along each lateral margin, its course terminated before the posterior marginal puncture by a slight upward curve of the border at posterior angle. Body winged. Peduncle with a concavity on each side (normally punctate) to receive intermediate femora. Elytra normally with seven punctate striæ and a lateral channel; third interstice with four ocelliform punctures along course of third stria. Prosternum strongly bordered on anterior margin, the episterna normally overhanging on sides anteriorly (the antennæ pass under the overhanging part of the sides when in repose). Metasternal episterna with epimera normally elongate and narrowed posteriorly, rarely short. Ventral segments transversely sulcate. Intermediate tibiæ with an acute spur on external side above apex, rarely at apex.

The features given above are normally present in Australian species of *Clivina*, therefore little, and often no use has been made of them in the descriptions which follow, but in all cases where any variation from the normal form has been observed it has been noted, except in the case of differences of the gular and temporal regions of the head, the gular sutures, the gular cicatrix and the anterior margin of the labrum), and where no allusion is made to any of the characters enumerated above in my descriptions of specimens before me, it is to be assumed that the form is normal.

The following characters seem to call for special notice, the chiefly because I have been compelled for the sake of descriptive exactness to adopt a new terminology for some features not hitherto used in diagnosing species of *Clivina*, and to vary some of the terms used by M. Putzeys for certain features.

The head is longitudinally impressed on each side, the anterior part of each of these impressions usually forming a wide and

irregular depression of variable depth *(frontal impressions)*; seta found on each side of the clypeus is situated in the fron impression, often the puncture from which it rises is lost in rugosity of the impression: from the frontal impressions t facial sulci extend backwards on each side of the face, and some species (e.g., *C. obliquata*, Putz.) a short light internal impre sion extends from the anterior part of the facial sulcus obliquel inwards and backwards on each side of the face—the facial sul may then be said to be *recurved* (this is a feature of evider classificatory importance) The clypeus is large, usually no divided from the front between the frontal impressions: when is so divided it is by a wide usually irregular impression. It necessary for descriptive purposes to divide the clypeus into thr areas, viz.—(1) *The clypeal elevation* ("elévation antérieure" Putzeys) being the raised part of the clypeus between the front impressions—(reference is usually made by me only to the sha of the anterior margin of the clypeal elevation); (2) *the media part* ("epistome" of Putzeys) being the central part of the clype in front of the clypeal elevation (usually I refer to the anteri margin only as the median part); (3) *the wings* ("petites ailes of Putzeys) being the lateral parts of the clypeus (usually a finel marked suture is noticeable between the wings of the clypeus an [illegible]

The median part is often defined on each side from the wings by a ridge, more or less distinct. I have made but little use of this feature, though these ridges seem not without value for diagnostic purposes).

The supra-antennal plates ("grandes ailes" of Putzeys) are the "frontal plates" (Horn) of the head under which the antennæ are inserted.

The elytra have the striæ at the base either (a) *all free*, or (b) *the four inner free*, the fifth uniting with the sixth, or (c) *the three inner free*, the fourth uniting with the fifth at the base. These variations are of great classificatory importance and seem to offer the most reliable means of grouping the species into primary divisions. The first stria of the elytra rises in an [illegible] puncture at the base, and in some species, especially the larger ones, the first and second striæ unite at the base, sometimes a short scutellar striole is very noticeable at the base of the first interstice (this is an important feature). The interstices [illegible] the eighth usually forming a narrow carina near the apex. A [illegible] humeral carina is generally present at the humeral [illegible]; when present it may vary in length and prominence and [illegible] formed by the basal part of (a) the seventh interstice, (b) the eighth interstice, or (c) the seventh and eighth together. The position of the posterior puncture of the third interstice [illegible], though useful when comparing specimens, I have not [illegible] in my descriptions.

The prosternum may be divided into the *pectoral part* and the *intercoxal part*, the point of union between these parts varying in [illegible] different degrees of width may be used, (a) *very wide* ([illegible] Putz., &c.), (b) *wide* (*C. lepida*, Putz., &c.), (c) *narrow* ([illegible], [illegible], &c.), (d) *very narrow* (*C. obliquata*, [illegible]), (e) *attenuate* (*C. melanopyga*, Putz., &c.). The difference in width of the intercoxal part anteriorly is of classificatory importance and of the greatest assistance in arranging the Australian species. The pectoral part is sometimes margined on each side posteriorly by a prominent border, [illegible] may be termed *the pectoral ridges* (vide *C. lepida*). The

base of the intercoxal part may be either transversely sulcate or not; this seems a useful feature for separating species.

The differences in the legs are of great classificatory importance, but need no special note beyond attention being drawn to the differences between the terms used by M. Putzeys in describing the digitation of the anterior tibiæ and those adopted by me. M. Putzeys disregarded the external apical projection and only made reference to the teeth on the outer side above the apex, while, in conformity with the usage of writers on the *Carenidæ*, I include the apical projection in counting the external teeth of the tibia

I have made no use of the maxillæ; in all the species which I have examined the inner lobe has been found to be hooked and acute at the apex; this form I believe to be invariable among the Australian species of *Clivina*, but Dr. Horn's drawings* of the maxillæ of North American species show that sometimes the inner lobe is obtuse at the apex.

M. Putzeys reduced the genus *Ceratoglossa*, Macleay, to a synonym of his genus *Scolyptus*, and, as far as the Australian fauna is concerned, I would merge *Scolyptus* in *Clivina*. There is no doubt in my mind that the species placed by me in the "*procera* group," several of which M. Putzeys put in *Scolyptus*, are congeneric with *C. basalis*, Chaud., &c. *C.*

known till 1858, when Bohemann described *C. australasiæ* from Sydney. In 1862 M. Putzeys published his "Postscriptum," in which he described four new Australian species. It may be noted that of these four species, all founded on unique specimens, three, viz., *C. elegans*, *C. attrata*, and *C. suturalis*, never seem to have turned up again; as will be seen from my notes on them, I suspect a possibility of the identity of two of them with subsequently described and known species. In 1863 Sir William Macleay described two *Scaritides* from N.S. Wales as *Ceratoglossa foveiceps* and *C. rugiceps*; these are species of *Clivina*, but both have to be dropped out of the Australian list for reasons stated below. In 1866 Putzeys published a Revision of the Australian species of Clivina, including descriptions of thirteen new Australian species—these descriptions he afterwards embodied in the "Révision Générale." I do not think it will be easy, if indeed possible, ever to identify *C. juvenis*, *C. prominens*, and *C. verticalis*. In 1867 Putzeys published his "Révision Générale," containing four new Australian species, and also he received for description the whole of Count Castelnau's collection of *Clivinides*, among which he found fourteen species of *Clivina* from Australia to describe as new; of these I have been able to identify six. Between 1868 and 1873 Putzeys added three species to our list, all of which are known to me. After 1873 no more species of Australian *Clivina* were described till 1889, when the Rev. Thos. Blackburn described nine new species, and since that date he has described three additional species, bringing the number known from Australia up to fifty two. I have now thirty one to add, making a total of eighty three species for Australia, a number which I expect to be largely augmented when the continent has been more carefully searched for these insects.

A few words on size and colour in reference to distinguishing species of the genus *Clivina* from one another will not be out of place. M. Putzeys seems to have regarded slight differences in these as of more than legitimate value in determining closely allied species, *vide* his descriptions of *C. juvenis*, *C. lepida* and *C. rubripes*, which are not decidedly differentiated among themselves or from

C. australasiæ, by mere size, though it is made a point
first importance in the original descriptions.*

Occasional dwarfed specimens of probably most spec
Clivina occur, which are so much smaller than the average
their species that if only two specimens, one small and the
of normal size, were placed in anyone's hands for descriptio
would more likely be regarded as different species than as
sentatives of the same species. It is only when we have
us a large series of specimens from one locality that we real
amount of variation in size, and therefore in appearance,
may occur in a species of *Clivina*. For instance, a specim
C. biplagiata only 5·5 mm. in length is in my possession -7·7
being the normal length of the species; and small specim
some species, *e.g.*, *C. adelaidæ*, appear to the eye too narro
light to be associated without hesitation with large specim
the same species.

It appears to me that too much importance must n
attached to mere colour for distinguishing species; imm
specimens are always more lightly coloured than those th
mature; and speaking as a practical collector I would call
tion to the fact that several immature specimens will some
represent all those of a species taken at one time and pla
this way immature specimens may be considered as typi

I have divided the Australian species of *Clivina* into thirteen groups; a synoptical view of these groups is given in the table below. The groups are formed in an arbitrary way, and no doubt their number might advantageously be reduced had I a surer knowledge of the affinities of the species.

Table grouping the Australian species of Clivina.

I. Elytra with striæ free at base. (Submarginal humeral carina wanting).

A. Facial sulci simple, clypeus emarginate; inter-coxal part of prosternum wide anteriorly.... *biplagiata* group.

AA. Facial sulci recurved, clypeus with median part angular; inter-coxal part of prosternum very narrow anteriorly........... .... *cribrosa* group.

II. Elytra with four inner striæ free at base, fifth joining sixth at base. (Submarginal humeral carina normally present).

B. Mandibles short.

C. Clypeus with five triangular projections in front................... .... *coronata* group.

CC. Clypeus with median part more or less angular laterally................................ *obliquata* group.

BB. Mandibles long, decussating.

D. Prothorax with border reaching base on each side.................................. *planiceps* group.

DD. Prothorax with border not reaching base *grandiceps* group.

III. Elytra with three inner striæ free at base, fourth joining fifth at base. (Submarginal humeral carina usually well developed).

E. Clypeus with median part more or less distinctly divided from wings along anterior margin (usually more prominent than wings).

F. Anterior femora with posterior edge of lower side strongly dilatate in middle............. *punctaticeps* group.

FF. Anterior femora not greatly dilatate on lower side.

G. Head very wide across occiput, eyes not prominent.

H. Size small; prothorax longer than broad, without anterior line....... *blackburni* group.

HH. Size moderate; prothorax broader than long, anterior line present... *olliffi* group.

GG. Eyes prominent.

I. Prosternum with intercoxal part attenuate... ... . *heterogena* group.

II. Prosternum with intercoxal part narrow...................... .... *bovillæ* group.

EE. Clypeus roundly emarginate, median part not divided from wings. ... ... *australasiæ* group.

EEE. Clypeus deeply truncate-emarginate, wings strongly advanced; (size usually large). .. *procera* group.

Following M. Putzeys' example, I define each group as I come to it.

I begin the descriptions of species by treating of two species, viz., *C. attrata*, Putz., and *C. obliterata*, Sl., which I have felt unable to place in any of the thirteen groups into which I have arranged the species of *Clivina* found in Australia *C. attrata* may not be an Australian species at all. *C. obliterata* seems a species of anomalous position, and, in view of its strong resemblance to *C. australasiæ*, Bohem., even of doubtful validity.

The above is M. Putzeys original description, which he supplemented by a longer and more minute one in French, from which I take the salient features as follows:—*

The epistoma is widely emarginate, its angles are prominent and are separated from the wings which are rounded and a little more advanced. The eyes are very prominent, posteriorly they are enclosed in the lateral margins of the head. The impression which separates the head from the neck is hardly distinct, especially in the middle. The striæ of the elytra are rather weak, but their punctuation is very distinct, they are less strongly impressed towards the external margin and hardly perceptible at the apex. The sixth interstice unites very indistinctly with the marginal border above the shoulder, not one of the striæ touches the base. The anterior tibiæ have at the apex a rather short digitation and a large strongly marked tooth.

In his "Revision Genérale" M. Putzeys forms a separate group (twenty fifth) for *C. attrata*, and treats of it in the following terms: This species, unique up to the present, has so much resemblance to *C. australasiæ*, that at first sight it might be taken for a mere variety. The tooth of the mentum is longer, attaining the height of the lateral lobes. The mandibles are very short, broad, less arcuate, less acute, only carinate at the base. The prothorax is much more convex, hardly narrowed in front, almost square, with the sides rounded and the anterior angles very declivous. The elytra are truncate at the base, the shoulders marked, the striæ wider and more deeply punctate. The fifth stria, and not the fourth touches the eighth interstice at the base. The central carina of the prosternum is rather strongly narrowed between the coxæ, shortly and lightly canaliculate; the apex is oval, deeply foveolate on the base.

* This revision being intended for the use of students in Australia, who often are unable to refer to the older (and scarce) literature of other countries, all M. Putzeys species have been dealt with, and translations of his remarks (except Latin diagnoses) on all species that are unknown to the author have been given.

In regard to its habitat, the original description states that the author had seen only a single specimen which came from New Holland. The "Révision Générale" rather throws doubt upon this by saying that this insect, formerly received as coming from South America, appears rather to be Australian.

It may be noted that in his tabular view of the species of Clivina in his "Postscriptum," p. 32, M. Putzeys gives as a distinguishing character of *C. attrata*—eighth interstice not prolonged above the shoulder.

The species for which I propose the name of *C. obliterata*, is an anomalous one among Australian species. It so closely resembles *C. australasiæ*, Bohem., as to seem merely a variety of that species; but as five specimens are before me, all agreeing in the basal characters of their elytra, I have felt compelled to regard it as distinct, and to place it with *C. attrata*, Putz. It requires more study, and should it prove to be a "sport" of *C. australasiæ*, of which there seems a possibility, it is a remarkable fact that the striæ free at the base should be accompanied by the total obliteration of the submarginal humeral carina.

CLIVINA OBLITERATA, n.sp.

Facies as in *C. australasiæ*, only the elytra more truncate at base, with striæ free at base and submarginal humeral carina wanting; anterior tibiæ 3-dentate. Black, four posterior legs piceous. Only differing from *C. australasiæ* as follows:—Head more evenly narrowed before eyes, (the sinuosity between the supra-antennal [illegible]

The anterior margin of the clypeus is exactly as in *C. australasiæ*, emarginate with the wings not divided from the median part; the prosternum is exactly as in *C. australasiæ*. Apart from its smaller size, and the form of the clypeus and anterior tibiæ, this species seems to present a remarkable resemblance to *C. attrata*, Putz.

Biplagiata group.

Head wide, short, strongly and roundly angustate in front of eyes; clypeus deeply emarginate, median part not divided from wings. Elytra with striæ free at base; submarginal humeral carina wanting Prosternum with intercoxal part wide anteriorly, sulcate on base. Anterior femora wide, lower side rounded; tibiæ 3-dentate.

CLIVINA BIPLAGIATA, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 43; Ann. Soc. Ent. Belg. 1866, x. p. 191.

Robust, convex. Black, with a reddish spot on each elytron just before apical declivity; anterior legs piceous, four posterior legs piceous red. Head wide; a shallow punctulate depression between clypeus and front; vertex smooth; clypeus deeply emarginate, wings small, not divided from median part; eyes prominent. Prothorax about as broad as long (1·8 × 1·75 mm.), widely convex, decidedly narrowed anteriorly; anterior angles very obtuse; basal curve short, rounded. Elytra convex, ovate, truncate at base, abruptly and deeply declivous to peduncle; striæ free at base, strongly punctate towards base, lighter and more finely punctate towards apex, seventh interrupted towards apex; interstices convex at base, depressed towards apex, eighth carinate on apical curve; submarginal humeral carina wanting. Prosternum with intercoxal part wide anteriorly, transversely sulcate on base; episterna finely transversely striolate. Anterior femora compressed, very wide, lower side rounded; anterior tibiæ 3-dentate. Length 7-7·8, breadth 2 mm. (One specimen in my collection only 5·5 mm. in length).

Hab. : Queensland—Cape York (from Mr. French), Port De son and Wide Bay (Masters); N.S. Wales—Sydney [commo Goulburn and Mulwala [rare] (Sloane); Victoria—Melbourne.

An isolated and easily identified species. The red subapi maculæ of the elytra vary in size and brightness; in one specim from Sydney in my possession they are wanting, the elytra bei entirely black. I have not found any perceptible punctures the prothorax as mentioned by Putzeys.

Cribrosa group.

Size moderate. Head short, wide and convex on occipu clypeus with median part angular; facial sulci recurved; ey depressed. Prothorax short, parallel; anterior angles marke Elytra with five inner striæ free at base; submarginal humer carina wanting. Prosternum with intercoxal part very narro anteriorly, sulcate on base. Anterior tibiæ strongly 4-dentate.

The species known to me may be divided into sections thus :—

I. Clypeus with angles of median part obtuse .... { *C. cribrosa* Put *C. boops*, Blkb. *C. fortis*, Sl. }

II. Clypeus with angles of median part prominent, dentiform .... *C. frenchi*, Sl.

marked: a well marked sinuosity between wings and supra-antennal plates, these wide, rounded externally; frontal impressions wide shallow, hardly marked; facial sulci hardly marked, curved part well marked; facial carinæ distant from eyes, straight, carinate; eyes not enclosed behind. Prothorax broader than long (1·3 × 1·4 mm.), very declivous to base; upper surface, excepting basal declivity, densely and strongly rugulose punctate; sides parallel; anterior margin truncate; anterior angles marked, very slightly advanced; posterior angles rounded; median and anterior lines distinctly marked; lateral basal impressions obsolete. Elytra a little wider than prothorax (3·2 × 1·5 mm.), base truncate, deeply and abruptly declivous to peduncle; apex widely rounded; striæ shallow, strongly punctate, entire, weaker near apex, seventh weak, obsolete on apical curve; marginal channel shallow in middle. Prosternum with intercoxal part very narrow anteriorly, sulcate on base; episterna overhanging anteriorly, very finely striolate near lateral margins. Anterior tibiæ wide, 4-dentate; intermediate tibiæ with external spur distant from apex, long, erect, acute.

Length 6-6·5, breadth 1·5 mm.

Hab. West Australia—King George's Sound (Masters), Beverley (Lea).

It greatly resembles *C. boops*, Blkb., some differences being its smaller size, lighter form, the whole of the disc of the prothorax strongly punctate and the less strongly impressed elytral striæ. The description given above is founded on specimens sent to me by Mr. Masters; their colour is coal black, a specimen sent by Mr. Lea is piceous, Putzeys gives the colour as piceous.

Note.—It is evident that Putzeys' measurements are incorrect; the species is rather a stoutly built little one, and, even in the most narrow species of *Clivina*, such a shape for the elytra as "3½ × 1½ mm." would be unheard of.

CLIVINA BOOPS, Blackburn.

P.L.S.N.S.W. 1889 (2), iv. p. 719.

Very closely allied to *C. cribrosa*, Putz., which it exactly resembles as to the head, shape of prothorax, elytra, legs, &c., for

some apparent differences between them see description of *cribrosa* (*ante*, p. 157).

These species require careful study with large series of fr specimens from different localities.

The dimensions of a specimen sent to me by Mr. Blackburn a length 7; head 1·2 × 1·4; proth. 1·6 × 1·75; el. 4 × 1·9 mm.

Hab.: South Australia -Adelaide, Port Lincoln (Blackbur Victoria—Melbourne (Kershaw).

Clivina fortis, n.sp.

Robust, cylindrical. Head punctate, large, wide and conve posteriorly, declivous in front, facial sulci recurved; prothor broader than long, not narrowed anteriorly, striolate-puncta towards sides; elytra with striæ free at base; prosternum wi intercoxal part very narrow anteriorly, sulcate on base; epister hardly rugulose, very finely transversely striolate; anterior tib 4-dentate. Black.

Head large, finely punctate on base of clypeus and middle front; vertex and occiput very convex, not punctate; a wi shallow impression between clypeus and front: clypeus dee declivous and rugose to median part, this narrow, strongly ema nate, its angles not marked; wings small, anterior margin slop

[redacted]

entire, finely punctate; interstices lightly convex, eighth narrow (not carinate) on apical curve. Intermediate tibiæ wide, incrassate, about three small projections above external spur.

Length 7·8, breadth 2·2 mm.

Hab.: N.S. Wales (unique in Rev. T. Blackburn's Collection).

This species is closely allied to *C. boops*, Blkb., from which its most conspicuous differences are its larger size, more depressed eyes, and the obtuse anterior angles of the prothorax.

Note.—A specimen sent to me for examination by Mr. Masters, and ticketed Tasmania, only differs from the above in having the fine punctures of the head spread over all the posterior part; and the strong puncturation of the prothorax over nearly the whole of the disc, the angles of the median part of the clypeus a little marked, and the anterior angles of prothorax more prominent; I do not feel quite sure that it is conspecific with *C. fortis*, but am unable to regard it as distinct.

Clivina frenchi, n.sp.

Parallel, cylindrical. Head large, facial sulci recurved; prothorax broader than long, not narrowed in front; elytra with five inner striæ free at base, submarginal humeral carina obsolete; anterior tibiæ 4-dentate. Head, prothorax, and legs piceous (four posterior legs more lightly coloured than anterior); elytra brown.

Head large (1·7 × 1·8 mm.), wide behind eyes, convex, on upper surface a shallow puncturation, except on posterior part of vertex: clypeus not divided from front; median part truncate, its angles forming a strong triangular projection; wings about as prominent towards sides as the angles of median part, defined posteriorly by an oblique line, external angles rounded; lateral setigerous punctures large, placed behind angles of median part a little in front of the line defining the wings behind; supra-antennal plates large, projecting decidedly beyond wings of clypeus; facial sulci not clearly marked, turning inwards in front, an ill-defined short impression extending obliquely inwards and backwards from their anterior part on each side of vertex; facial carinæ short; eyes deeply

embedded, hardly more prominent than supra-antennal pla
of head behind eyes finely and densely rugose-puncta
hardly rugulose. Mandibles short, flat. Mentum de
obliquely emarginate; lobes rounded at apex; median too
long, triangular. Prothorax a little broader than lon
2·25 mm.), not narrowed anteriorly, convex, transversely
towards sides; anterior margin truncate; anterior angl
advanced; posterior angles rounded; basal curve short
narrow; median line well marked, linear; anterior line
(sometimes well marked, sometimes obsolete); later
impressions usually well marked, elongate (reaching
middle of prothorax), rugulose Elytra convex, a litt
than prothorax (5 × 2·5 mm.), parallel on sides, truncat
widely rounded at apex; striæ punctate for whole leng
lightly impressed towards apex; interstices lightly conve
base, eighth not carinate at base, distinct and wide (not
on apical curve. Prosternum with intercoxal part
anteriorly, transversely sulcate on base; episterna
shagreened, with fine wavy transverse striolæ. Ventral
smooth. Anterior femora short, wide; anterior tibiæ 4
the upper tooth prominent, triangular; intermediate ti
external spur long, acute.

Length 7 6-9, breadth 2-2·5 mm.

CLIVINA CORONATA, Putzeys.

Ann. Soc. Ent. Belg. xvi. 1873, p. 17.

Narrow, cylindrical. Clypeus with five prominent projections in front; prothorax parallel on sides; elytra parallel on sides, fifth stria joining sixth at base; prosternum with intercoxal part attenuate anteriorly; anterior tibiæ strongly 4-dentate. Testaceous, elytra more lightly coloured than head and prothorax.

Head depressed, lightly impressed, finely punctulate; frontal foveæ nearly obsolete; facial sulci obsolete, forming a wide shallow depression on each side of vertex; facial carinæ distant from eyes, feebly developed; supra antennal plates large, overshadowing the eyes at base, obtusely pointed in front; eyes not prominent. Prothorax rather longer than broad (1·25 × 1·2 mm.), finely striolate near sides, lateral basal impressions elongate. Elytra hardly wider than prothorax (2·7 mm. × 1·25 mm.), punctate-striate; striæ entire; interstices lightly convex, eighth marked on apical curve; submarginal humeral carina very fine and weakly developed. Prosternum with episterna minutely shagreened, not transversely striolate. Anterior femora wide, with lower edge rounded.

Length 5·2, breadth 1·25 mm.

Hab.: West Australia—King George's Sound (Masters).

This species is readily distinguished by the form of the anterior margin of the head with seven triangular projections. I have not found any perceptible punctures on the sides of the prothorax as mentioned by Putzeys. I have not been able to observe the base of the prosternum with accuracy in my specimen, so cannot say if it is transversely sulcate or not.

Obliquata group.

Size moderate or small. Front punctate, clypeus with angles and median part marked; facial sulci more or less recurved. Mandibles short. Elytra with four inner striæ free, fifth joining sixth at base; submarginal humeral carina present, not strongly developed. Prosternum with intercoxal part very narrow or

attenuate anteriorly, sulcate on base. Anterior tibiæ 4-den
(the upper tooth sometimes feebly indicated or obsolete).

Table of Species.

I. Elytra punctate-striate.
  A. Unicolorous.
    B. Dorsal surface depressed.
      C. Prothorax as long as, or longer than broad.
        D. Size medium, fourth stria of elytra outturned at base.................... *C. obliquata*, Putz
        DD. Size small, fourth stria of elytra not outturned at base .... *C. debilis*, Blkb.
      CC. Prothorax broader then long (none of the elytral striæ outturned at base) .... *C. riverinæ*, Sl.
    BB. Form cylindrical.
      E. Anterior tibiæ 3-dentate, interstices of elytra convex ....*C. cylindriformis*, S
      EE. Anterior tibiæ 4-dentate, interstices of elytra depressed.. ....*C. obsoleta*, Sl.
  AA. Bicolorous.
      F. Elytra with basal part red, apical black .. *C. melanopyga*, P
      FF. Elytra reddish with a black sutural vitta *C. dorsalis*, Blkb

[redacted]

[illegible] at base; interstices lightly convex on basal part of disc, [illegible] posteriorly, eighth narrowly carinate at apex; submarginal carina short, feebly carinate. Prosternum with intercoxal part small, very narrow anteriorly, sulcate on base; [illegible] minutely shagreened, the transverse striole hardly perceptible. Anterior femora wide, lower side rounded; tibiae [illegible].

Head rather small, frontal impressions wide, well marked, [illegible] elevation raised and prominent; clypeus divided from front by a shallow punctulate impression, depressed near anterior margin, median part emarginate-truncate, its angles hardly [illegible] beyond wings, hardly marked, wings truncate, external angles marked, obtuse; supra-antennal plates large, projecting [illegible] and sharply beyond wings of clypeus, rounded and [illegible] laterally; eyes lightly convex, not prominent, strongly [illegible] behind. Prothorax rather longer than broad (1.75 x 1.7 mm.); sides widely and very feebly sinuate behind anterior [illegible]; anterior margin truncate, anterior angles marked, obtuse. Elytra elongate, very little wider than prothorax (3.8 x 1.75 mm.); four inner striae strongly impressed, fifth and sixth strongly impressed near base, becoming obsolete after anterior third, [illegible] entire, distinctly impressed; posterior puncture of third interstice near apex.

Length 7, breadth 1.75 mm.

Hab. South Australia: Port Lincoln (Coll. Castelnau). (Two specimens were sent to me by Mr. Masters, ticketed South Australia.)

It appears probable that the identification of *C. obliquata* has been rendered difficult by a certain vagueness in Putzeys' description, *e.g.*, when he says that *C. obliquata* may be distinguished at the first glance by its long, narrow and almost cylindrical elytra; this probably should be read as comparative to *C. [illegible]*, Putz., the only other member of the group in which he placed *C. obliquata*, known to him, and of which he says the elytra are *elongate, almost cylindrical* (though, being a more than [illegible] depressed species, I should not call them so); again,

though he places *C. obliquata* in a group characterised by the fifth stria, not the fourth, reaching the eighth interstice, he says, in the description, that the fourth *unites more or less distinctly with the eighth at the base*; in *C. obliquata* it turns out at the base, but does not actually join the fifth.

CLIVINA DEBILIS, Blackburn.

P.L.S.N.S.W. 1889 (2), iv. p. 722.

Black, legs testaceous. Narrow, elongate, subdepressed. Clypeus with median part truncate, hardly distinct from wings, its angles very weak; wings truncate, external angles squarely obtuse; supra-antennal plates projecting strongly beyond wings of clypeus. Prothorax quadrate (1·2 × 1·1 mm.). Elytra parallel (2·8 × 1·3 mm.); fifth stria joining sixth at base, seventh well marked in all its course. Prosternum with intercoxal part very narrow anteriorly, transversely sulcate on base. Anterior tibiæ narrow, 3-dentate (only an obsolete trace of an upper prominence).

Length 5, breadth 1·3 mm.

Hab.: South Australia—Adelaide, Port Lincoln (Blackburn).

Closely allied to *C. obliquata*, Putz., from which its small size will at once distinguish it. The description above is founded on a specimen for which I am indebted to Rev. T. Blackburn.

A specimen brought from Lake Callabonna (Central Australia) by Mr. A. Zietz, in 1893, differs slightly, being a little larger (5·3 × 1·4 mm.), and having the prothorax with longer sides (basal curve short), (1·4 × 1·2 mm.), the disc punctate near the sides; the angles of the median part of the clypeus more prominent, the

[redacted]

Head large (1·4 × 1·5 mm.), anterior part depressed; vertex wide, *lightly* convex, more or less punctate: clypeus declivous, divided from front by a wide—usually punctulate—depression; median part bordered, wide, lightly emarginate-truncate, its angles projecting obtusely beyond wings; these small, almost square, with external angle obtuse; supra-antennal plates large, bordered, projecting strongly and squarely beyond wings of clypeus, anterior angle obtuse, but marked; facial sulci deep, recurved part obsolete (sometimes feebly indicated); facial carinæ strong; eyes convex, rather prominent, lightly enclosed behind. Mentum wide, deeply and obliquely emarginate; lobes widely rounded at apex; median tooth triangular, acute. Prothorax depressed, quadrate (2 × 2·1 mm.), widest behind middle, very shortly declivous to base, a little narrowed anteriorly (ant. width 1·9 mm.); sides very lightly rounded; posterior angles rounded, not marked; basal curve short; anterior margin truncate; anterior angles wide, obtuse, a little prominent; border narrow; median and anterior lines strongly impressed; lateral basal impressions obsolete, or very lightly marked. Elytra depressed, hardly wider than prothorax (4·5 × 2·2 mm.), parallel, widely rounded at apex, truncate at base; striæ punctate, weaker towards apex, fifth and sixth obsolete except near base, seventh lightly marked, not punctate; eighth interstice narrow, subcarinate on apical curve; border narrow. Prosternum not protuberant; episterna finely shagreened, marked with wavy transverse lines. Anterior femora short, wide; anterior tibiæ strongly 3-dentate, a small triangular prominence above the upper tooth.

Length 7·2-8·6, breadth 2-2·7 mm.

Hab.: Victoria—Swan Hill (C. French); N.S. Wales—Urana District (Sloane—moderately plentiful on the edges of a large marsh 20 miles N.E. from Urana.)

Allied to *C. obliquata*, Putz., which it greatly resembles; it is a broader and more depressed species (being the most depressed Australian species), the prothorax is more transverse, being broader than long, and less parallel on the sides. The submarginal humeral carina of the elytra is very short and hardly

carinate—it might be described as nearly obsolete. The specii (♂) from which the measurements used in the description w taken was 8·4 mm. in length.

Clivina cylindriformis, n sp.

Narrow, cylindrical. Head with recurved facial sulci; p thorax as long as broad, longitudinally convex; elytra stron punctate-striate, fourth stria free, lightly outturned at base, fi joining sixth at base; prosternum with intercoxal part w narrow anteriorly; anterior tibiæ 3-dentate. Head, prothor and under surface of body piceous black; elytra piceous bro (piceous black near suture at beginning of apical declivity); un surface of prothorax piceous red, legs ferruginous.

Head convex (1·1 × 1·3 mm.); clypeus divided from front a wide punctate impression, an elongate punctate depressior middle of front extending backwards from this impression; si of head punctate behind eyes, the puncturation strong on e side above base of facial carinæ, median part of clypeus ema nate-truncate, bordered, its angles widely obtuse, hardly project beyond wings; these small, subrotundate in front with exter margin widely rounded (their margin extends in a slightly une curve from median part to supra-antennal plates); supra-anten

stria not interrupted towards apex; interstices convex, eighth narrow and distinct on apical curve; submarginal humeral carina short and feebly developed; lateral border narrow. Prosternum not protuberant, transversely sulcate on base; episterna minutely shagreened, not transversely striolate. Anterior femora short, wide; lower side canaliculate, with posterior edge rounded.

Length 7, breadth 1·9 mm.

Hab.: Queensland—Gulf of Carpentaria (one specimen sent to me by Mr. C. French).

Differs from *C. obliquata*, Putz., in colour, facies, and the 3-dentate anterior tibiæ.

Clivina obsoleta, n.sp.

Narrow, cylindrical. Head wide; facial sulci obsolete; clypeus with angles of median part projecting beyond the wings; eyes not prominent; prothorax about as long as wide, very lightly narrowed anteriorly; elytra parallel, fifth stria joining sixth at base; prosternum with intercoxal part attenuate anteriorly; anterior tibiæ strongly 4-dentate. Ferruginous, elytra a little more lightly coloured than head and prothorax.

Head wide between eyes and across occiput; front finely, not densely, punctate; vertex finely punctate on each side behind facial carinæ; clypeal elevation truncate; median part of clypeus depressed, defined on each side by a carinate ridge, truncate, its angles projecting decidedly beyond wings in the form of obtuse triangular teeth; wings small, concave, quadrate, external angle marked; supra-antennal plates projecting beyond and divided from clypeal wings by a sharp sinuosity; facial carinæ short, weakly developed; eyes convex, not prominent, hardly at all enclosed behind. Prothorax convex, smooth (except for a few transverse striolæ); anterior margin truncate; anterior angles obtuse, feebly indicated; posterior angles widely rounded; basal curve short; lateral basal impressions short, lightly impressed; median line well marked; anterior line hardly marked. Elytra long, parallel (3·3 × 1·5 mm.), truncate and strongly declivous at base, widely rounded at apex, very declivous to sides and apex; striæ

lightly impressed, entire, finely punctate; interstices not convex, eighth narrow near apex; submarginal humeral carina short, narrow, weak. Prosternum with episterna minutely shagreened. Anterior femora wide, lower side rounded; anterior tibiæ widely palmate, upper internal spine thick, curved, incrassate.

Length 6, breadth 1·5 mm.

Hab.: Queensland Cape York (unique in the collection of the Rev. T. Blackburn).

This is an isolated species; in general appearance it is rather like *C. blackburni*, Sl., but its nearest ally known to me seems to be *C. frenchi*, Sl., which it resembles in its widely palmate tibiæ; in *C. frenchi* the upper internal spine of the anterior tibiæ is greatly developed, though not so thick as in *C. obsoleta*. I have placed it in the "*obliquata group*," because it has the elytra with the fifth stria joining the sixth at base, and has a submarginal carina at each shoulder.

Clivina melanopyga, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 41; Ann. Soc. Ent. Belg. x. 1866, p. 187.

This species is at once distinguished from all other Australian species by its colour, its rather depressed form, and by having the four inner striæ of the elytra free at the base. The following brief note will sufficiently characterise it.

Head, prothorax, undersurface and apical part of elytra black; elytra reddish on more than anterior half; legs piceous. Head, including clypeus, as in *C. obliquata*, Putz., prothorax quadrate

[redacted]

CLIVINA DORSALIS, Blackburn.

P.L.S.N.S.W. 1889 (2), iv. p. 719.

Parallel, lightly convex. Black; elytra red with a black sutural stripe (this stripe occupying only first interstice at base, widening posteriorly and extending over three inner interstices, not reaching apex); anterior legs ferruginous, four posterior testaceous Front punctate; clypeus with median part lightly emarginate-truncate, its angles hardly marked, its wings small with anterior margin truncate, their exterior angles obtuse but marked; facial sulci recurved. Prothorax quadrate (1·2 × 1·2 mm.), evenly and lightly convex, punctulate. Elytra a little broader than prothorax (2·5 × 1·35 mm), widely rounded at apex, evenly and lightly convex; striæ strongly impressed, entire, punctate, fifth joining sixth at base. Prosternum with intercoxal part attenuate anteriorly, transversely sulcate on base; episterna minutely shagreened, obsoletely transversely striolate. Anterior tibiæ 4-dentate, the upper tooth very feeble.

Length 5, breadth 1·35 mm.

Hab.: Victoria (Kershaw); South Australia—Adelaide, Port Lincoln (Blackburn); West Australia—King George's Sound (Masters), Beverley (Lea).

This species agrees with M. Putzeys' original description of *C. suturalis* in every particular, except that from the group in which he placed *C. suturalis* it should have the fourth stria joining the fifth at the base, but he placed *C. planiceps* in the same group as also having the fourth stria joining the fifth at the base, which was incorrect, and it is impossible for me to avoid a suspicion that *C. dorsalis*, Blkb., = *C. suturalis*, Putz. If so, Putzeys' description is erroneous, and nothing but an inspection of his type, or the discovery of a species coloured like *C. dorsalis*, and having the fourth and fifth striæ of the elytra confluent at the base, can now settle the point.*

* See descriptions of *C. suturalis* and *C. verticalis* (*post*) for further remarks on this subject.

Clivina bicolor, n.sp.

Narrow, parallel, subdepressed. Head short, convex. sulci recurved, eyes not prominent: prothorax longer than parallel on sides; upper surface densely and strongly pu elytra parallel, finely punctate-striate; four inner striæ fr joining sixth at base; interstices depressed, eighth cari apex, and shoulders; anterior tibiæ 4-dentate. Elytra ferru red; prothorax and head piceous, under surface piceous.

Head convex and smooth on vertex, a few fine punct anterior part of front: clypeus with median part trunc angles prominent, triangular; wings wide, subquadrate, h advanced as angles of median part, external angles s marked, obtuse at summit, external margin straight; supra-a plates large, projecting sharply and strongly beyond w clypeus; facial carinæ hardly marked; eyes convex, not prominent, weakly enclosed behind. Prothorax longe broad (1·2 × 1·1 mm.), lightly convex, lightly declivous upper surface—excepting basal declivity and anterior strongly punctate; sides parallel, a little narrowed at angles; anterior margin truncate; anterior angles marked; basal impressions lightly marked, elongate. Elytra ve wider than prothorax (2·5 × 1·25 mm.); sides subparallel

[redacted]

CLIVINA DENTICOLLIS, n.sp.

Robust, lightly convex. Head depressed, transversely impressed posteriorly, eyes very large and convex; prothorax subquadrate; posterior angles marked, shortly dentate: elytra parallel, simply striate; four inner striæ free at base; a well marked striole at base of first interstice; submarginal humeral carina wanting: prosternum with intercoxal part canaliculate, wide anteriorly, transversely sulcate on base; episterna very finely transversely striolate, not overhanging in front; lateral cavities of peduncle punctulate: anterior tibiæ strongly 3-dentate; intermediate tibiæ not wide, external spur stout, acute, very near apex. Ferruginous, eyes black.

Head depressed, widely impressed across occiput; front depressed, rugulose; frontal impressions very shallow; facial sulci wide, shallow, nearly obsolete; vertex smooth, minutely punctulate; facial carinæ wide, short, lightly raised: clypeus with median part truncate, its angles small, obtuse, very lightly advanced; wings small, concave (less advanced than median part), external angles rounded; supra-antennal plates rather depressed, rounded externally, a strong sinuosity dividing them from clypeus wings; eyes very large, convex, prominent, projecting far beyond supra-antennal plates; gulæ smoother than usual, lightly punctate near eyes. Labial palpi stout, terminal joint stout, subfusiform (obtuse at apex). Prothorax broader than long (1·3 × 1·4 mm.), lightly and evenly convex: disc covered with fine transverse striolæ; anterior margin truncate, vertical at sides of neck; anterior angles obtuse; sides evenly rounded; posterior angles marked by a short but decided dentiform projection; basal curve short; border narrow, lightly reflexed on sides, very fine (not reflexed) on sides of basal curve; median and anterior lines strongly impressed; lateral basal impressions wanting. Elytra much wider than prothorax (3 3 × 1·8 mm.), lightly rounded on sides, widely rounded at apex; base truncate; striæ simple, entire, lightly impressed, fifth joining sixth at base, seventh entire; interstices

depressed, eighth hardly carinate on apical curve. Ante
femora not channelled below, lower side not dilatate or rounde

Length 6, breadth 1·8 mm.

Hab. : West Australia—N. W. Coast (?); (sent to me by Mr
French).

A remarkable and isolated species, not nearly allied to
other Australian species. In facies it resembles *C. pectora*
Putz.; its head is much like that of *C. bovillæ*, Blkb., but
eyes are larger; the form of the clypeus is like that of the spe
of the "*obliquata group*"; the intercoxal part of the prostern
is as wide as in typical members of the "*australasiæ gro*
Although I have placed it in the "*obliquata group*," it might
be regarded as the type of a new group, of which the charact
would be those of the preliminary paragraph of the descript
above.

Planiceps group.

Size large. Mandibles long, decussating. Clypeus with med
part truncate, wings wide, truncate, sharply advanced. Labr
truncate, 5-setose. Labial palpi with penultimate joint slenc
longer than terminal. Elytra with four inner striæ free at b
fifth joining sixth, submarginal humeral carina present. Pros
num with intercoxal part very wide anteriorly, non-sulcate

A well-known species, which may be distinguished by the following note:—

Cylindrical. Black, under surface piceous, legs reddish or reddish piceous. Head large (2·3 × 2·3 mm.), depressed, rugulose; clypeus with wings strongly and obliquely advanced beyond the truncate median part. Prothorax longer than broad (3·5 × 3·3 mm.), lightly narrowed anteriorly (ant. width 3 mm.). Elytra parallel (7·6 × 3 5 mm.), crenulate-striate; four inner striæ free at base, fourth a little outturned at base, fifth joining sixth at base; eighth interstice distinct on apical curve; a submarginal carina at shoulders. Anterior tibiæ 3-dentate.

Length 12·5-16·5, breadth 3-4 mm.

Hab.: N.S. Wales—Murray and Murrumbidgee Rivers.

M. Putzeys in his "Postscriptum" places this species in a group characterised by having the fourth and fifth striæ confluent at base; he makes no reference to this feature in his description, nor does he remark on it in Stett. Ent. Zeit., nor in his "Révision Générale," where he merely puts it in *Scolyptus*, and places *Ceratoglossus rugiceps*, Macl., as a synonym without comment. Rarely the fourth interstice does turn outwards at the base, and actually join the fifth; one such example is in my collection from Mulwala on the Murray, where this species is very common.

CLIVINA CRASSICOLLIS, Putzeys.

Scolyptus crassicollis, Putz., Ann. Soc. Ent. Belg. 1866, x. p. 25.

The following is a translation of Putzeys' whole description (*sic*) of this species:—

Larger than *C. planiceps*; its elytra are proportionately more elongate; the prothorax is very noticeably more convex, more declivous particularly towards the anterior angles; the anterior margin is less emarginate.

Length 18, el. 9, breadth 4 mm.

New South Wales—two specimens.

The above is an example of the uselessness of some of M. Putzeys' descriptions; it might be founded on the large specimens

from the Gulf of Carpentaria mentioned below under *C. quadratifrons*, Sl.; but, if so, the description does not aid one in determining it, besides the inference is that the anterior tibiæ are 3-dentate as in *C. planiceps.*

Clivina quadratifrons, n.sp.

Robust, parallel, cylindrical. Head flat, rugulose; prothorax about as long as broad; elytra with fifth stria joining sixth at base, eighth interstice distinctly marked on apical curve, a well-developed submarginal carina at shoulders; anterior tibiæ 4-dentate. Black, under surface piceous, anterior legs reddish piceous, four posterior legs and antennæ testaceous brown.

Head quadrate (2 × 2·1 mm.), flat, rugulose: clypeus not divided from front; median part truncate; wings divided from supra-antennal plates by a light linear impression, lightly and obliquely advanced beyond median part, wide, truncate, external angle marked, rounded; supra-antennal plates depressed, declivous before eyes, divided from clypeal wing by a light sinuosity; external margin sinuate, facial sulci lost in facial rugulosity; facial carinæ distant from eyes, feebly developed; eyes convex, prominent; orbits narrow, abruptly truncate behind eyes. Mandibles wide at base, decussating. Mentum concave; lobes rounded at apex, lightly longitudinally striate; median tooth large, rounded at apex. Prothorax of almost equal length and breadth (3·6 × 3·5 mm.), parallel on sides, very little narrowed to apex; convex, roundly declivous to base; anterior margin truncate; anterior angles obtuse; posterior angles not marked; border wide

abrupt and non-sulcate on base; episterna covered with fine wavy transverse striæ. Ventral segments smooth. Anterior femora short, wide, compressed, lightly channelled below, posterior margin of lower side wide in middle; tibiæ wide, palmate, external teeth strong and close together; intermediate tibiæ wide, incrassate, external edge arcuate above subapical spur, this strong, acute.

Length 13·5-16, breadth 3·3-4·2 mm.

Hab.: New South Wales—Urana District (Sloane); Victoria —Mildura (French).

Note.—Two specimens have been sent to me by Mr. C. French as coming from near Burketown on the Gulf of Carpentaria, which, though appearing at first sight to be a different species from *C. quadratifrons*, yet, on a close examination, reveal no differences that I can see, except their larger size. I regard them as merely the northern form of a widely distributed species (dimensions, head 2·8 x 2·8 mm., prothorax 4·5 x 4·3 mm., elytra 10 x 4·6 mm.). It is possible this may be *C. crassicollis*, Putz., but it is not to my eye a more elongate and convex species than *C. planiceps*; besides Putzeys' brief note (not a description) on *C. crassicollis* seems to infer only 3-dentate anterior tibiæ for that species.

C. quadratifrons is closely allied to *C. planiceps*, which it resembles in size and appearance; but decided differences to which attention may be directed are the shorter and more parallel prothorax, the clypeus with the wings less advanced beyond the median part, and the 4-dentate anterior tibiæ.

Clivina carpentaria, n.sp.

Narrow, cylindrical. Head not rugulose; prothorax longer than broad: elytra with striæ entire, fifth joining sixth at base; interstices convex, eighth not visible on apical curve; ventral segments rugulose laterally; anterior tibiæ 4-dentate. Black, shining; legs piceous brown.

Head smooth, large, depressed (1·6 x 2 mm.); a shallow transverse line dividing clypeus from front, and a strong sulcus dividing clypeal wings from supra-antennal plates; clypeal elevation

well defined, almost semicircular: clypeus with median part truncate; wings lightly and abruptly advanced beyond median part, wide, flat, truncate, rounded at external angles and laterally; supra-antennal plates depressed, declivous externally, lightly rounded, narrowly margined; facial sulci short; supra-orbital setæ placed near each eye in a short depression, upper edge of this depression forming a thick round carina, lower edge forming a narrow carina; eyes globose, very prominent, projecting strongly from sides of head. Mandibles large, wide at base, decussating. Mentum deeply and obliquely emarginate; median tooth wide, short; lobes strongly striolate, rounded at apex. Prothorax lævigate, longer than broad (2·8 × 2·5 mm.), widest a little in front of posterior angles, a little narrowed anteriorly (ant. width 2·25 mm.); sides lightly and widely sinuate; posterior angles rounded; anterior margin truncate; anterior angles obtuse; border reflexed on sides; median and anterior lines strongly impressed; lateral basal impressions wanting. Elytra cylindrical, parallel, hardly wider than prothorax (5·7 × 2·6 mm.); base widely and very lightly emarginate; shoulders obtuse, apex strongly declivous; striæ strongly impressed, crenulate; interstices convex, seventh and eighth uniting and forming a short carina at base; lateral border narrowly reflexed. Prosternum protuberant; intercoxal part wide anteriorly, not transversely sulcate on base; episterna finely rugulose and transversely striolate. Ventral segments smooth in middle, first and second strongly and closely longitudinally striolate, third striolate-punctate, fourth, fifth and sixth rugulose-punctate at sides. Anterior femora short, wide, lightly

[redacted]

wings; these very wide, rounded, hardly more advanced than centre of median part. Mandibles long, decussating, wide at base. Labrum 5-setose. Palpi filiform; labial with penultimate joint slender, longer than terminal. Prothorax transverse; border not reaching base on sides of basal curve; anterior marginal puncture very near anterior angle. Elytra with four striæ free at base; submarginal humeral carina short, feebly developed. Prosternum with intercoxal part greatly narrowed (not attenuate) anteriorly. Anterior tibiæ 4-dentate.

CLIVINA GRANDICEPS, n.sp.

Comparatively short. Head large, smooth, vertex convex; prothorax short, lateral border not attaining base; anterior tibiæ 4-dentate. Black, shining; legs light piceous brown; palpi piceous.

Head large, transverse (2·4 x 2·9 mm.); vertex convex, lævigate: clypeus slightly rugulose, divided from front by a straight transverse impression (this impression hardly distinct in middle); anterior margin sinuate; median part lightly rounded in middle; wings large, wide, divided from median part by a light sinuosity, widely rounded in front and laterally, a little more prominent than median part, lateral setæ placed in a sharply defined foveiform puncture about middle of each wing; supra-antennal plates small, convex, divided from clypeal wings by a light sinuosity, roundly protuberant and margined laterally; facial sulci lightly impressed, two supra-orbital setæ on each side placed a considerable distance from eye in a deep groove, the lower as well as the upper edge of this groove carinate; eyes convex, projecting beyond supra-antennal plates; orbits enclosing eyes lightly behind, sloping obliquely to neck. Mandibles large, wide at base, decussating. Labrum large; anterior margin subrotundate (lightly truncate in middle), 5-setose. Mentum lightly and squarely emarginate; median tooth short, widely triangular; lobes rugulose, wide, obliquely truncate to apex on external side. Palpi filiform. Antennæ long, slender, not incrassate, first joint long (about as long as two succeeding ones). Prothorax short, transverse (2·2 x 2·9 mm.),

widest just behind anterior angles, convex, slightly depressed each side of median line, abruptly declivous to base; sides paral- anterior margin emarginate in middle; anterior angles obtu- explanate; posterior angles wide, but marked; basal curve sho- lateral border wide and reflexed on sides, interrupted and upturne- at posterior angles just before posterior marginal puncture, thic- and indistinct on anterior part of basal curve, obsolete on posteri- part and not reaching base, border strongly reflexed and margin- channel wide on base; median and anterior lines strongly im- pressed; lateral marginal punctures large, anterior placed ne- anterior angle on the explanate border. Elytra convex, very little wider than prothorax (5·7 × 3·1 mm.), hardly narrowed to base, wide at apex; sides lightly rounded; base truncate; shoulders rounded; striæ entire, crenulate, strongly impressed, weaker on apical declivity, fifth joining sixth at base, seventh obsolete on apical curve; interstices convex, eighth obsolete towards apex; submarginal humeral carina short, thick; lateral border wide, reflexed Prosternum with intercoxal part lightly concave, narrow (not attenuate) anteriorly, base abrupt, not transversely sulcate; episterna overhanging in front, transversely rugulose-striate. Ventral segments smooth, excepting two basal ones lightly longitudinally striolate. Anterior femora light, lower side straight; anterior tibiæ 4-dentate, apex strongly outturned, external teeth wide apart, strong, triangular; external spur of intermediate tibiæ fine, acute.

Length 10·5, breadth 3·1 mm.

Hab. Queensland: Gulf of Carpentaria (one specimen, given

[redacted]

Prosternum with intercoxal part attenuate anteriorly, sulcate on base. Anterior femora with posterior margin of lower side strongly dilatate in middle, tibiæ 4-dentate.

Table of species.

A. Form cylindrical, prothorax longer than broad...	*C. punctaticeps*, Putz. *C. tumidipes*, Sl.
AA. Form subdepressed, prothorax broader than long	*C. lobipes*, Sl.

Clivina punctaticeps, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 18.

Closely allied to *C. tumidipes*, Sl., of which it seems the northern form, and from which it only appears to differ by its ferruginous colour; prothorax proportionately wider; elytra a little more deeply striate, the interstices more convex. The legs are similar in all respects.

I offer the following brief diagnosis founded on a specimen sent to me for examination by the Rev. Thos. Blackburn :—

Elongate, cylindrical. Head moderate; front punctulate; vertex coarsely punctulate in middle and posteriorly from side to side: clypeus with median part projecting strongly beyond wings, lightly emarginate, its angles prominent, triangular; wings small, rounded, strongly divided from median part and lightly from supra-antennal plates. Prothorax a little longer than broad (1·6 x 1·5 mm.), a little narrowed anteriorly (ant. width 1·3 mm.). Elytra oval (3·5 x 1·75 mm.), strongly punctate-striate; fourth stria joining fifth at base; a distinct striole at base of first interstice; the interstices convex, eighth well defined for whole length, carinate at base. Prosternum with intercoxal part attenuate anteriorly. Anterior femora thick, strongly and roundly dilatate in middle of lower side; anterior tibiæ 4-dentate.

Length 5·5-6, breadth 1·7-1·75 mm.

Hab. : Queensland—Cape York ; Rockhampton (Coll. Blackburn: Macleay Museum).

Clivina tumidipes, n.sp.

P.L.S.N.S.W. 1889 (2), iv. p. 720.

Elongate, parallel. Head punctulate anteriorly, eyes proı prothorax longer than broad, convex: elytra parallel, (punctate-striate; fourth and fifth striæ confluent at base; . distinct submarginal carina at shoulder; an elongate fine at base of first interstice, anterior femora with posterior of lower side strongly and roundly dilatate, anterior tı dentate. Black, shining; under surface piceous; anteri piceous brown; four posterior legs, antennæ and palpi ı testaceous.

Head moderate; front closely and finely punctate; smooth (sometimes some fine punctures near posterior ext of each facial carina): clypeus not divided from front; part deeply and rather angularly emarginate, its obtuse, very lightly advanced beyond and hardly divide wings; these small, hardly divided laterally from supra-aı plates; lateral setæ of clypeus placed in a rugose depres base of each wing; supra-antennal plates small, depresse globose, prominent, lightly enclosed behind; orbits abrupt Prothorax smooth (sometimes a few transverse wrinkles o longer than broad (1·7 × 1·5 mm.), widest near posterior

prominence above apical projection; anterior trochanters projecting lightly and obtusely beyond base of femora.

Length 5·6-7, breadth 1·3-1·7 mm.

Hab.: N.S. Wales—Junee District, Urana District (Sloane); Victoria—Swan Hill (French); South Australia—Adelaide (Blackburn).

This species must be very closely allied to *C. emarginata*, Putz., but evidently differs in colour. I took it plentifully twenty miles north-east from the town of Urana on the margins of tanks dug to water sheep (the only permanent water), in the months of December and January; as many as 32 specimens were washed out of part of the muddy margin of one tank in less than half an hour.

CLIVINA EMARGINATA, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 15.

"Nigra nitida, ore, antennis, pedibus, elytrorum basi apiceque externis testaceis. Clypeus emarginatus, alis subæqualis. Vertex antice profunde et dense punctatus. Prothorax subquadratus, lævis. Elytra cylindrica, basi intus oblique truncata, humeris rotundatis. Femora antica extus in medio inferiore dilatata. Long. 5¾, El. 4, Lat. 1¼ mill."*

M. Putzeys supplemented this diagnosis by remarks which I translate as follows:—

This species forms a link between the twenty-seventh group in which the rounded wings of the epistoma extend considerably beyond the epistoma itself and the twenty-eighth,† in which the

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* It is evident there is an error in these measurements; the length given for the elytra is certainly too great.

† By twenty-seventh and twenty-eighth groups M. Putzeys appears to have meant, on this occasion, the groups of which *C. nyctosyloides*, Putz., (for which he formed a new twenty-seventh group in place of his old twenty-seventh, *C. procera* being transferred to *Scolyptus*, and *C. heterogena*, Putz., are respectively the types; but as on the following page he refers *C. heterogena* to a *thirtieth group* it is apparent that twenty-eighth is a mistake.

epistoma, more or less emarginate, has its angles prominent extending beyond the wings, which are usually angular.

In *C. emarginata* the epistoma is deeply emarginate; its angles are not more advanced than the wings, from which it appears to be separated by a depression which there is between them. The anterior elevation, broad, though but little raised, is strongly punctate the same as all the anterior part of the head; the puncturation almost disappears on the vertex, which is very convex and the fovea of which is shallow. The prothorax is almost square, just a little longer than broad; the sides are lightly narrowed at the anterior third, but then regain their width up to the anterior angles, which are obtuse and declivous. The surface is smooth, the median line is very deep from the base to the anterior line; one can hardly distinguish a feeble trace of the two lateral foveæ. The elytra are cylindrical, obliquely truncate, internally at the base; the shoulders are rounded; the striæ become hardly distinct towards the apex; they are strongly punctate. The anterior femora are thick, their lower surface is dilatate externally so as to form a rounded prominence, but the trochanter projecting at the apex makes a prominent angle.

Australia. One specimen (Coll. Casteln.)

In facies *C. emarginata* must resemble *C. tumidipes*, Sl., but it is differently coloured. The clypeus may resemble that of *C. lobipes*, Sl., but seems as if it should be not unlike *C. borillæ*, Blkb. I should expect the tibiæ to be 4-dentate, and the prosternum with the intercoxal part narrow. Its colour should render its recognition easy. I have associated it with *C. adelaidæ*

[redacted]

femora lobate, tibiæ strongly 4-dentate. Reddish piceous; elytra lighter coloured than head and prothorax, with a dark piceous spot on posterior part of disc.

Head wide, depressed; front and clypeal elevation closely rugulose-punctate; a round fovea in middle behind punctate part; vertex wide, smooth; frontal impressions wide, shallow; facial sulci lightly impressed; clypeal elevation hardly raised: clypeus not divided from front; median part deeply emarginate, defined on each side by a slight ridge, not angulate laterally; wings small, not divided from median part, sloping roundly backwards to and divided from supra-antennal plates by a faint wide sinuosity; eyes prominent, hemispherical, lightly enclosed behind. Prothorax subquadrate (1·5 × 1·55 mm.), lightly convex, coarsely punctate except on anterior part of disc and near sides; anterior margin truncate, angles obtuse, but marked; sides parallel, lightly and widely emarginate; posterior angles marked; basal curve sloping sharply to base on each side; median line deeply, anterior line lightly impressed. Elytra very little wider than prothorax (3·2 × 1·6 mm.), convex—not cylindrical,—parallel on sides; base truncate; shoulders rounded, with border prominent; striæ entire, seventh not interrupted at beginning of apical curve; interstices lightly convex, eighth finally carinate at base, narrow and lightly carinate near apex. Anterior femora with lower side forming a wide round protuberance; external spur of intermediate tibiæ long, acute.

Length 6·3, breadth 1·6 mm.

Hab.: Queensland—King's Plains Station (28 miles S.W. from Cooktown; one specimen sent to me by Mr. N. H. Gibson).

It seems to be allied to *C. emarginata*, Putz.; the clypeus and anterior femora are apparently similar, but *C. lobipes* is evidently a broader species, differing in having the prothorax not longer than broad, and roughly punctate on the disc. From *C. tumidipes*, Sl., and *C. punctaticeps*, Putz., species with lobate anterior femora, it is easily distinguished by its wider and less cylindrical form, shorter punctate prothorax, &c.

Blackburni group.

Size small, form cylindrical. Head large, convex; short, wide; eyes not prominent; facial sulci recurved; with angles of median part very lightly advanced beyond these with external angles rounded, but marked; supra-a plates projecting strongly beyond clypeus. Prothorax long broad, anterior line wanting Elytra with fourth and fift confluent at base. Prosternum with intercoxal part at anteriorly, sulcate on base Anterior tibiæ 4-dentate.

The facies of this species, the short wide head, the long cylindrical prothorax and elytra, the non-prominent ey have caused me to separate *C. blackburni* from *C. het* Putz., and form a distinct group for it.

CLIVINA BLACKBURNI, n. sp.

Narrow, parallel, cylindrical. Head large, facial sulci re eyes very depressed; prothorax longer than broad, ante wanting: elytra lightly punctate-striate, fourth stria fifth at base, interstices depressed, eighth carinate at base, and carinate on apical curve, anterior tibiæ 4-dentate. brown.

Head large, convex; vertex smooth, front finely pu

median tooth moderate, triangular, pointed. Mandibles short, thick. Prothorax smooth (a few light rugæ near sides), parallel, very little wider than head with eyes, longer than broad (1·4 × 1 mm.), roundly and strongly declivous to base; anterior margin truncate; base wide; basal curve short, rounded; posterior angles widely rounded; basal angles obtuse; median line well marked, linear. Elytra parallel, cylindrical (3 × 1·2 mm.), truncate at base, widely rounded at apex; apical declivity roundly abrupt; striæ entire, lightly impressed, finely punctate; interstices not at all convex, posterior puncture of third much nearer apex than basal. Prosternum with intercoxal part attenuate anteriorly, transversely sulcate on base; episterna obsoletely transversely striolate, overhanging anteriorly. Legs short; anterior femora short, thick, rounded on lower side; anterior tibiæ strongly 4-dentate; upper tooth short, triangular; posterior tibiæ short, incrassate.

Length 5 3, breadth 1·2 mm.

Hab : South Australia—Lake Callabonna.

A very distinct species; its narrow cylindrical shape, with the elytra shortly and widely terminated, give it a general resemblance to a member of the family *Bostrychidæ*.

CLIVINA OLLIFFI, n sp.

Robust, parallel. Head large; prothorax a little broader than long: elytra long, parallel; fourth stria joining fifth at base; submarginal humeral carina feebly developed; eighth interstice marked, but not carinate on apical curve; a well marked striole at base of first interstice. Prosternum with intercoxal part attenuate anteriorly; transverse sulcus of base obsolete. Anterior tibiæ 4-dentate. Black; prothorax piceous black; anterior legs testaceous brown, four posterior legs testaceous.

Head large (1·3 × 1·5 mm.), densely rugose-punctulate on gulæ and behind eyes; vertex convex, lævigate; front lightly impressed and punctulate in middle, lightly and widely impressed on each side (the impressions a little rugulose); clypeal elevation slightly

raised, narrow, arcuate: clypeus wide, depressed; median p-
truncate, its angles small, triangular, projecting; wings strong
divided from median part, anterior margin sloping lightly forwa
to external angles, these prominent, obtuse at apex; sup
antennal plates depressed, very strongly divided from clyp
wings, prominent and rounded externally: eyes convex, not prom
ent, lightly enclosed behind; facial sulci obsolete; facial car
short, distant from eyes. Mandibles wide, short, ligh
decussating. Labrum 5-setose. Mentum rugulose-stri
Labial palpi slender, two apical joints of about equal len
Antennæ short, lightly incrassate. Prothorax a little broa
than long (1·8 × 1·9 mm.), lightly convex, subdepressed al
median line, lightly declivous to base, transversely striol
lightly punctulate except near anterior margin on middle of
and on basal declivity; sides parallel, not narrowed anterio
posterior angles rounded, not marked; anterior margin trunc
on each side, emarginate in middle; anterior angles obtuse; bor
narrow; median line deeply impressed; anterior line well mark
lateral basal impressions hardly marked. Elytra hardly wi
than prothorax (4·5 × 2 mm.), widest behind middle, subpara
on sides, very lightly rounded, a little narrowed to should
disc subdepressed; sides and apex strongly and deeply decliv
base truncate; shoulders marked, striæ deep, except towards ap

A remarkable and isolated species, for which I have found it necessary to form a separate group. In general appearance, shape of head, prothorax, elytra, prosternum and legs it resembles the species of the "*cribrosa group*"; but the fourth stria is outturned to join the fifth at the base. The crenulations of the elytral striæ are deep and punctiform, and from them fine short transverse striæ are given off, causing the interstices to have an undulate appearance. The external angles of the clypeal wings are strongly marked and quite as advanced as (if not a little more so than) the angles of the median part; the anterior margin of the wings slopes inwards and thus causes the median part to project sharply forward on each side. The elytra are concave on the three inner interstices near the base, and have a distinct elongate scutellar striole.

I have named this species in memory of my friend Mr. A. S. Olliff, late Government Entomologist for New South Wales.

Heterogena group.

Size small. Eyes prominent; clypeus with median part angular, the angles projecting beyond the wings, these angular laterally. Elytra with fourth and fifth striæ confluent at base, seventh not interrupted at beginning of apical curve; submarginal humeral carina present; no striole noticeable at base of first interstice. Prosternum with intercoxal part attenuate anteriorly, sulcate on base. Anterior tibiæ 4-dentate.

Nine species, viz., *C. angustula*, Putz., *C. australica*, Sl., *C. deplanata*, Putz., *C. difformis*, Putz., *C. flava*, Putz., *C. heterogena*, Putz., *C. odontomera*, Putz., *C. oodnadattæ*, Blkb., and *C. tuberculifrons*, Blkb., seem to belong to this group; of these I know only two, therefore do not attempt to tabulate them.

CLIVINA HETEROGENA, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 41; Ann. Soc. Ent. Belg. 1866, x. p. 189.

Although I have a suspicion that *C. heterogena* will ultimate prove to be identical with *C. angustula*, the evidence before is insufficient to enable me to feel absolutely certain about th I therefore append a translation of the description of *C. heterogen*

The anterior elevation, well marked and rather short, separated from the vertex by a punctate impression of but litt depth; the summit of the head bears a wide longitudinal im pression containing some large punctures; the punctures o each side near the eyes are of the same size.

The eyes, of which only half is distinct, are very prominent. The prothorax is square, a little sinuate on the sides, as broad in front as behind; all the surface, except the anterior part in the middle, is covered with very distinct punctures.

The elytra are very elongate [and] cylindrical; their rounded shoulders are reflexed; they are of a piceous brown, but their external border, the suture before and behind, and the shoulders are of a testaceous colour. The fourth stria turns out at the base and reaches the eighth interstice.

The under surface of the body is black; the legs, except the upper side of the femora, the palpi and the antennæ are testaceous. The anterior tibiæ have externally two very long teeth and a small not very distinct tooth.

Length $5\frac{1}{2}$, El. $2\frac{3}{4}$, breadth $1\frac{1}{2}$ mm.

Australia. One specimen belonging to M. de Chaudoir, who received it from M. Melly.

[redacted]

CLIVINA ANGUSTULA, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 42; Ann. Soc. Ent. Belg. 1866, x. p. 190.

Narrow, parallel, subcylindrical. Black, head and prothorax piceous black; elytra with suture and margins (excepting base) reddish; legs reddish, four posterior paler than anterior. Head wide, short before eyes, front and vertex punctate: clypeus divided from front by a wide shallow punctate depression; clypeal elevation prominent, widely rounded; a wide depressed space near anterior margin; median part emarginate-truncate, the angles lightly advanced beyond wings, obtuse; wings square, with external angles rounded, supra-antennal plates wide, rounded externally, projecting decidedly beyond clypeal wings; eyes prominent; facial sulci hardly impressed, facial carinæ narrow, well developed. Prothorax about as long as broad (1·3 × 1·2 mm.) a little narrowed anteriorly (ant. width 1·1 mm.), convex, punctate; sides lightly and widely sinuate behind anterior marginal puncture. Elytra parallel (2·7 × 1·3 mm.), convex, punctate-striate; striæ entire; eighth interstice carinate at base and on apical curve. Prosternum with intercoxal part attenuate anteriorly; episterna rugulose and striolate. Anterior tibiæ 4-dentate.

Length 4·2-5·2, breadth 1-1·4 mm.

Hab. : N.S. Wales—Clarence River, Windsor (Lea), Carrathool (Sloane); Victoria—Lillydale, Ferntree Gully (Sloane); South Australia (Blackburn).

The description given above is founded on specimens taken at Lillydale and Ferntree Gully, near Melbourne. Putzeys' description suggests the inference that the prothorax is not narrowed anteriorly, but in my specimens, which I have no doubt are *C. angustula*, Putz., the prothorax certainly is narrowed; different specimens vary in degree in this respect, which I believe to be a sexual difference.

C. angustula seems to present considerable differences in co and size;* its constant features are the puncturation of the l and prothorax, the form of the clypeus, the striation of the el the anterior femora not dilatate on lower side, the trochan prominent at base of femora, and the digitation of the ant tibiæ.

I offer the following notes on some variations that have under my notice :—

(1). A numerous series of specimens sent to me by Mr A Lea, taken at Windsor, N.S.W., vary as follows :—

Length 4·2-5·2, breadth 1-1·4 mm. Colour (*a*) testac (immature); (*b*) ferruginous (slightly immature ?); (*c*) ferrugi with interstices 2-5 of elytra obscurely piceous on posterior of disc; (*d*) ferruginous with interstices 2-5 wholly piceous ex at apex; (*e*) head and prothorax piceous brown, elytra red with interstices 2-4 piceous black on posterior part of disc apical declivity.

(2) Specimens from the Clarence River, also received Mr. Lea, are apparently narrower and more depressed, testac with posterior part, excepting apices of interstices 2-4, obsc piceous. This form seems a variety or closely allied species, requires studying with more specimens than are available to

(3) Specimens from Carrathool (Murrumbidgee River) I

separate it from "No. 3" on a single specimen, and without a knowledge that the form of the lower side of the tibiæ was constant; especially seeing that gummed on the same card, and therefore presumably from the same locality, was a specimen exactly resembling it, but with femora as in *C. angustula.*

Clivina deplanata, Putzeys.

Ann. Soc. Ent. Belg. 1866, x. p. 190

In his unsatisfactory note on this species all that M. Putzeys has to say is that it is with hesitation he separates this species from C. *angustula,* which it resembles in every respect except that the prothorax is a little broader and especially decidedly flatter. The colour is as variable as in *C. angustula.* All the specimens seen came from Melbourne.

Clivina flava, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 17.

"Testaceo-flava, capite prothoraceque obscurioribus. Caput in vertice late nec profunde foveolatum, parce punctulatum. Prothorax brevis subquadratus, angulis anticis deflexis, lateribus rectis, utrinque in medio praesertim punctatus. Elytra subcylindrica, basi truncata, humeris rotundatis, striis integris punctatis, interstitio 3° quadripunctato. Tibiæ antice latæ, apice longe digitatæ, extus bidigitatæ denticuloque superiore armatæ.

"Long. $5\frac{1}{2}$, El. $2\frac{3}{4}$, Lat. $1\frac{1}{3}$ mill."

Putzeys' remarks on this species are very full. I select for translation those bearing on important features.

Of a testaceous red, with the head, prothorax, and apex of the mandibles of a clear brown. The epistoma is rather narrow, a little emarginate; its angles are prominent and project beyond the little wings, which are very definitely separated from them; the anterior elevation is hardly marked, glabrous, separated from the vertex by a deep irregular punctate impression.

The vertex bears a longitudinal fovea, in the centre of which some large punctures are noticeable; the occiput and the sides of

the head alike bear some punctures. The eyes are very nent and project decidedly beyond the large wings; the p border extends over half their breadth.

The prothorax is almost square, a little broader than lo anterior margin is not emarginate; the sides are straig anterior angles are obtuse, but depressed; the border w little and forms a slight prominence at the posterior which are marked by a large puncture; the surface is very convex; the median line is wider and deeper anterior towards the base; each side of the prothorax is cover punctures, which are particularly distinct in the middle not extend to the base; the two lateral impressions are and very lightly marked.

The elytra are a little wider than the prothorax, cyl truncate at the base; their shoulders are rounded; the s deep and very distinct for their whole length, punctate al the apex; the interstices are lightly convex. The head is rugose beneath; the prothorax is much more finely rug transversely striolate. The abdomen is smooth. The trochanters form a feeble prominence at the base of the the tibiæ are wide, strongly digitate externally, and su upper surface; the intermediate tibiæ have three or four sp bristles above the spur.

The following is a translation of Putzeys' remarks on this species, which is unknown to me :—

The vertex is punctate; it bears a lightly impressed oblong wide fovea, where the punctures are denser. The antennæ are thick, moniliform. The eyes are prominent, but greatly enclosed by the postocular tubercles. The prothorax is longer than broad, narrowed in front, but particularly behind the anterior angles; these are lightly advanced; the posterior angles are distinct; the lightly convex surface bears some striolæ and some small scattered punctures.

The elytra are cylindrical; their base is truncate, but the shoulders are a little rounded; under a strong lens it is seen that the interstices are covered with small transverse undulations not close together. The elytra are piceous, with all their margins (including the suture) of a rather clear brown.

The femora are narrow. The anterior tibiæ, sulcate on upper side, have externally two very strong teeth. The apical digitation is thicker, and one-half longer than the inner apical spine.

Hab. : Probably the north-west of Australia (Coll. Castelnau; a single specimen only).

CLIVINA AUSTRALICA, n.sp.

Narrow, parallel, subcylindrical. Head short, convex; eyes large, convex, not prominent; facial sulci lightly recurved: prothorax parallel, longer than broad: elytra long, parallel; fourth stria joining fifth at base; eighth interstice distinct on apical curve; submarginal humeral carina moderate, narrow; prosternum with intercoxal part attenuate anteriorly; episterna very finely striolate near lateral margins, overhanging anteriorly; anterior tibiæ 4-dentate. Ferruginous.

Head sparsely covered with minute, nearly obsolete punctures: clypeus with median part wide, truncate (obsoletely emarginate between angles), angles obtuse, hardly prominent; wings small, hardly divided from but not so prominent as angles of median part, outer angles obtuse, external side straight; supra-antennal plates

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projecting sharply beyond wings; recurved part of facial suture well marked, lightly oblique; facial carinæ well developed, narrow; eyes very lightly enclosed behind. Prothorax longer than broad (1·15 × 1 mm.), hardly narrowed anteriorly, declivous to base, transversely striolate near sides, anterior margin truncate, anterior angles marked, not prominent; posterior angles widely rounded; border narrow; median line strongly impressed; anterior line lightly marked; lateral basal impressions obsolete. Elytra hardly wider than prothorax (2·3 × 1·1 mm.), parallel, convex, widely rounded, and very declivous to apex; base lightly emarginate, shoulders rounded but marked; striæ lightly impressed, entire, finely punctate, seventh not interrupted near apical curve; interstices lightly convex on anterior part of disc. Anterior femora short, wide; intermediate tibiæ wide, external margin arcuate, external spur long, slender, acute.

Length 4·3, breadth 1·1 mm.

Hab.: N.W. Australia (sent by Mr. Masters.)

Allied to *C. angustula*, Putz., but distinguished by its more cylindrical form, impunctate prothorax, &c. The form of the clypeus is as in *C. dorsalis*, Blkb., but the outer angles of the wings are more rectangular. It should resemble, judging from the description *C. verticalis*, Putz., but is smaller, its prothorax is exceptionally long, and the outer angles of the wings of the clypeus should be more marked. It is evidently distinct from *C. difformis*, Putz.; attention may be directed to the following points of difference from Putzeys' description, the smaller size, different colour, eyes lightly enclosed in the weakly developed

4-punctato. Femora antica subtus ante apicem dentata; tibiæ latæ, apice longe digitatæ, extus digitatæ [? bidigitatæ] denticuloque superiore armatæ.

"Long. 5, El. $3\frac{1}{2}$, Lat. $1\frac{1}{4}$ mill."

"Rockhampton (Coll. Castelnau)."

Appended is a translation of his further remarks on this species:—

It has the appearance of *C. punctaticeps*; however, the prothorax is more convex, narrower, particularly anteriorly; it is usually a little more distinctly punctate.

The epistoma is wider, more truncate; the head is covered with punctures [which are] much more numerous and almost rugulose. The anterior femora, less wide and less thick, have not beneath an inflation analogous to that of *C. lobata*, but they have, a little before the apex, a strong acute tooth, and the apex of the trochanters is equally raised in the form of a tooth.

It appears to me that *C. odontomera* must be allied rather to *C. angustula*, Putz., than to *C. adelaidæ*, Blkb.

Bovillæ group.

Clypeus with median part and wings almost on same level; median part divided from wings on each side by a small triangular sinuosity. Elytra with fourth and fifth striæ confluent at base, submarginal humeral carina present. Prosternum with intercoxal part very narrow and canaliculate anteriorly, sulcate on base; pectoral ridges short, well developed. Anterior tibiæ 4-dentate.

I do not feel sure that I am right in separating *C. bovillæ* from the "*heterogena group*"; this has been done on account of the different form of the intercoxal part of the prosternum. Probably the "*punctaticeps, blackburni, olliffi, heterogena,* and *bovillæ groups*" might with advantage be regarded as sections of one large group.

CLIVINA BOVILLÆ, Blackburn.

P.L.S.N.S.W. 1889 (2), iv. p. 717.

Piceous brown. Robust, parallel. Head wide, depressed anteriorly; clypeal elevation prominent, convex, hardly arcuate:

clypeus widely depressed near anterior margin; median pa
subtruncate (hardly emarginate), its angles obtuse, very
marked, hardly advanced beyond wings; these smal
external angles rounded; supra antennal plates projecting
and decidedly beyond wings; facial carinæ wide; eyes pro
enclosed behind. Prothorax convex, subquadrate (1·65 × 1·
lightly narrowed anteriorly (ant. width 1·5 mm.); sides
rounded (not sinuate); basal curve short. Elytra wide
prothorax (3·6 × 1·9 mm.), convex; sides parallel; lateral
wide and strongly bordered at shoulders; striæ entire,
impressed, finely crenulate; interstices convex (depresse
apex), eighth narrowly carinate at base and apex. Pros
with intercoxal part small, narrow and canaliculate ant
base sulcate; pectoral ridges short, distinct; episterna c
rugulose. Anterior femora wide; tibiæ strongly 4-dent
upper tooth small.

Length 6-6·8, breadth 1·7-1·9 mm.

Hab.: Northern Territory of S.A. (Mrs. Bovill); We
tralia; Queensland—Gulf of Carpentaria (received fro
French).

The position of *C. bovillæ* is between *C. australasiæ*, Bo
C. heterogena, Putz. The clypeus conforms nearly to

[redacted]

joining fifth at base; submarginal humeral carina short, weak; interstices lightly convex, eighth carinate at apex: prosternum with intercoxal part angustate (narrow, but not attenuate) anteriorly, sulcate on base; episterna very finely transversely striolate; anterior tibiæ strongly 4-dentate. Ferruginous brown, legs testaceous.

Head with front and vertex depressed, finely but distinctly punctate; supra-antennal plates and wings of clypeus flat; clypeal elevation lightly raised, subtruncate (lightly rounded): clypeus not divided from front, depressed near anterior margin; median part with margin lightly rounded; wings short, wide, strongly advanced beyond median part, external angles rounded but a little marked; supra-antennal plates projecting strongly and sharply beyond wings of clypeus; eyes prominent, convex, very lightly enclosed. Prothorax subquadrate (1·8 × 1·8 mm.), very little narrowed anteriorly (ant. width 1·65 mm.); disc smooth; basal declivity rugulose; sides subparallel, hardly rounded or sinuate; posterior angles rounded, but lightly marked; anterior margin truncate; anterior angles rounded, not marked; border reflexed, passing round anterior angles; median and anterior lines well marked; lateral basal impressions rather long, deep, narrow, punctulate. Elytra wider than prothorax (3·8 × 2 mm.), parallel on sides, widely rounded at apex; base truncate towards sides, emarginate in middle; shoulders rounded, seventh stria entire, not interrupted at beginning of apical curve. Anterior femora short, wide

Length 7, breadth 2 mm.

Hab.: North-west Australia (two specimens sent by Mr. Masters); Queensland—Rockhampton (Putzeys; Coll. Castelnau).

The species on which the above description is founded agrees so well with Putzeys' description of *C. cava*, that I have little hesitation in regarding it as that species. The strongly 4-dentate anterior tibiæ associate it with *C. bovillæ*, Blkb., but the depressed head and the clypeus deeply truncate-emarginate, with wide wings isolate it from all other Australian species. I have not included it among the species of the "*australasiæ group,*" but have felt unwilling to form a separate group for it, so have left it

in an intermediate position between the "*bovillæ*" and "*austra-lasiæ groups*."

Australasiæ group.

Mandibles short; eyes prominent; clypeus with anterior margi emarginate, wings widely rounded, not divided from median par Elytra with fourth and fifth striæ confluent at base; submargin humeral carina well developed; eight interstice carinate near ape

The "*australasiæ group*" may be divided into four sections a shown in the following table :—

A. Prosternal episterna more or less rugulose-striolate, not punctate.

B. Prosternum with intercoxal part attenuate anteriorly, anterior tibiæ 4-dentate. .... Section I. (Type *C. sellata*).

BB. Prosternum with intercoxal part narrow anteriorly, anterior tibiæ with two strong external teeth and a slight prominence above apical projection. ..... Section II. (Type *C. australasiæ*

BBB. Prosternum with intercoxal part wide anteriorly, anterior tibiæ 3-dentate .... Section III. (Type *C. basalis*).

AA. Prosternal episterna punctate........ Section IV. (Type *C. pectoralis*)

CLIVINA SELLATA, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 40; Ann. Soc. Ent. Belg. 1866, x. p. 186.

Head and prothorax black; elytra testaceous, with a large black patch on posterior part of disc; four posterior legs testaceous, anterior legs ferruginous; under surface piceous. Narrow, cylindrical. Front rugulose-punctate; vertex foveate in middle; clypeus with median part not divided from wings, lightly emarginate; clypeal elevation prominent, arcuate; a decided sinuosity between supra-antennal plates and wings of clypeus. Prothorax smooth (disc lightly transversely striolate and covered with scattered minute punctures), convex, rather longer than broad (1·35 x 1·25 mm.), lightly narrowed anteriorly (ant. width 1 mm.). Elytra convex, parallel (2·9 x 1·5 mm.), strongly punctate-striate; striæ entire, fourth joining fifth at base; interstices convex, eighth distinct on apical curve; a submarginal carina at shoulder. Prosternum with intercoxal part attenuate anteriorly, transversely sulcate on base; episterna finely shagreened and transversely striolate. Anterior femora wide, compressed; tibiæ 4-dentate (upper tooth a small triangular prominence).

Length 4·3-5·5, breadth 1·25-1·5 mm.

Hab.: Queensland—Gayndah (Masters); N.S. Wales—Richmond River, Tamworth, Sydney (Lea), Narrandera, Carrathool, Mulwala, Junee (Sloane); Victoria—Melbourne (Kershaw); South Australia (Masters).

The characteristic features of this widely distributed species are the 4-dentate tibiæ, the attenuate intercoxal part of the prosternum, and the colour. Immature specimens are often taken of an entirely testaceous colour.

CLIVINA FERRUGINEA, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 14.

"Ferruginea. Caput in vertice foveolatum, parce punctulatum. Prothorax subquadratus, antice leviter angustatus, convexus, utrinque in medio et in foveis basalibus oblongis

punctulatus. Elytra subcylindrica, basi truncata, humeris s rotundatis; striis integris punctatis, interstitio tertio quad punctato. Tibiæ anticæ apice longe digitatæ, extus bidigita denticuloque superiore armatæ.

"Long. 6, El. 3, Lat. 1½ mill."

After the Latin diagnosis M. Putzeys has some remarks, which the following is a translation :—

The epistoma roundly emarginate and closely united to th wings, which are rounded, classes the species very clearly among those of the twenty-seventh [? twenty-eighth] group.

It has a very great resemblance to *C flava*, in which, however, the epistoma is quite differently shaped; but the colour of the elytra is the same as that of the head and prothorax; the prothorax is less quadrate, more elongate, decidedly more convex, the sides are less straight, the vertex is more convex, less punctate, and the anterior elevation is less distinctly separated by a transverse impression.

The episterna of the prothorax are hardly distinctly striolate on their internal part.

Hab.: Rockhampton (Coll. Castelnau).

Specimens sent to me by the Rev. T. Blackburn as coming from Cairns, North Queensland, agree with the description of *C. ferruginea*, except in the following points:—size a little smaller, prothorax smooth (a few very minute punctures are discernible in and near the lateral basal impression with a very powerful lens). The following brief diagnosis gives particulars of

trochanters projecting beyond base of femora, these not dilatate on lower side; tibiæ 4-dentate.

Length 5·3, breadth 1·35 mm.

A specimen sent by Mr. Masters, as coming from N.W. Australia, cannot be separated from the specimens from Cairns.

Clivina occulta, n.sp.

Narrow, convex. Head wide before eyes; prothorax narrow, convex; elytra strongly punctate-striate, fourth stria outturned and joining fifth at base; prosternum with intercoxal part small, attenuate anteriorly, sulcate on base; anterior tibiæ wide, strongly 3-dentate. Black, shining; antennæ ferruginous, legs reddish testaceous.

Head short, rather depressed, sparsely and coarsely punctate; vertex convex; frontal foveæ very wide: clypeus lightly declivous to anterior margin; median part truncate, not divided from wings; these oblique on inner side to median part, decidedly advanced beyond median part, widely and lightly rounded in front; supra-antennal plates wide, rounded externally, projecting lightly but decidedly beyond wings of clypeus; eyes prominent; orbits truncate behind. Prothorax small, narrow, hardly broader than long (1·4 × 1·42 mm.), a little narrowed to apex (ant. width 1·25 mm.), convex, strongly declivous to base; disc transversely striolate; sides widely and very lightly sinuate behind anterior marginal puncture; lateral basal impressions distinct, narrow, elongate-foveiform. Elytra narrow (3·25 × 1·65 mm.), widest behind middle, same width as prothorax at base, truncate on base; striæ strongly impressed, entire, coarsely punctate (the punctures stronger than usual towards apex), seventh stria entire; interstices convex, depressed towards apex, eighth shortly carinate at base.

Length 6·2, breadth 1·65 mm.

Hab.: Queensland —Cape York (Coll. Blackburn; a single specimen).

This species must be associated with *C. sellata*, Putz., though the form of its clypeus is more that of the "*obliquata group*" than of *C. sellata*. In general appearance it resembles *C. queenslandica*, Sl., and *C. dilutipes*, Putz.: from *C. queenslandica* it may be distinguished by its more convex shape; clypeus with median part more truncate, the wings wider, concave, more decidedly advanced beyond median part and roundly subtruncate; elytra with striæ more coarsely punctate; prosternum with intercoxal part attenuate: from *C. dilutipes* the wider and punctate anterior part of the head, the stronger external teeth of the anterior tibiæ, and the shape of the intercoxal part of the prosternum thoroughly differentiate it.

Clivina nana, n.sp.

Small, depressed, parallel. Head wide, depressed; prothorax subquadrate; elytra lightly crenulate-striate, fourth stria joining fifth at base, interstices flat, eighth weakly carinate at base, finely and weakly carinate near apex; prosternum with intercoxal part narrow anteriorly; episterna minutely rugulose-striolate; anterior tibiæ wide, strongly 3-dentate. Testaceous, eyes black.

Head depressed; vertex roundly concave in middle; clypeal elevation well marked, lunulate: clypeus divided from front by a shallow depression, anterior margin subtruncate (hardly emarginate); wings small, not divided from median part, rounded laterally, divided from supra-antennal plates by a decided sinuosity;

angle, not touching margin. Elytra very little wider than prothorax (2 x 0·9 mm.), depressed; sides parallel; base truncate.

Length 3·6, breadth 0·9 mm.

Hab.: N.S. Wales—Tamworth (Lea).

An isolated species among those known to me, and the smallest Australian Clivina yet described.

CLIVINA SUTURALIS, Putzeys.

Mém. Liége, 1863, xviii. p. 39; Stett. Ent. Zeit. 1866, xxvii. p. 40; Ann. Soc. Ent. Belg. 1866, x. p. 186.

"Nigra, nitida, ore, antennis pedibus elytrisque testaceo-ferrugineis; hisce plaga suturali nigra ornatis. Clypeus truncatus angulis elevatis prominulis. Vertex depressus, punctatus. Pronotum subelongato-quadratum, punctatum, basi utrinque longitudinaliter impressum. Elytra elongata subcylindrica, profunde punctato-striata. Tibiæ anticæ extus obtuse bidentatæ."

"Long. 6, El. 3, Lat. 1⅓ mm."

M. Putzeys added to his Latin diagnosis a fuller description in French; the following is a translation of the more salient parts:—

The epistoma is almost truncate, bordered; its angles project in the form of prominent teeth; the wings are hardly distinct from the supra-antennal margins. The vertex is flattened in the middle, irregularly foveolate and punctate; the longitudinal carinæ of the sides of the head are very distinct and straight; they do not become broader towards their source.

The prothorax is a little longer than broad; its sides are parallel; the anterior angles are lightly rounded and very declivous; the posterior angles are only marked by the interruption of the marginal border and by a piliferous puncture placed within it; all the surface (except the margins) is covered with rather large punctures, which are stronger and more numerous on the sides near the basal foveæ; these are oblong, rather wide, but shallow.

The elytra are of the same width as the prothorax, elongate; their sides are almost parallel; the base appears truncate and the

apex is rounded, they are strongly punctate-striate. T scutellar striole is oblique and short. The suture is occupied b stripe of brown-black which, at the base, covers the first intersti and becomes wider after the basal fourth without extend beyond the third interstice.

Hab. : Australia—Port Phillip; (one specimen).

In his "Révision Générale" the following is all that is said this species :—

In a great many respects it comes very near *C. verticalis*; t prothorax has the same form, but it is less convex, longer a still more enlarged behind the anterior angles; it is covered wi a very distinct puncturation. The epistoma has the extern angle of its wings more marked, simply obtuse, and the win are not separated from the posterior wings. The anteri elevation is less marked, the vertex has only some scatter punctures anteriorly. All the external teeth of the tibiæ a obliterated, which may well be only accidental

Length 5, El. 2½, breadth 1½ mm.

In spite of M. Putzeys' having placed *C. suturalis* in a secti in which the fourth stria joined the fifth at the base,* I cann help a suspicion that it did not do so, and that *C. suturalis* w founded on the same species that Mr. Blackburn has since nam

[redacted]

is slightly brownish. The decided difference is found in the shape of the prothorax, which is almost square, as broad before as behind; the lateral margin is a little sinuate before the anterior angle. The elytra are more cylindrical, not at all narrowed behind. In all other respects it resembles *C. sellata*.

Length $5\frac{1}{4}$, El. $2\frac{2}{3}$, breadth $1\frac{1}{2}$ mm.

Australia—(Coll. Chaudoir; two specimens).

I have an immature specimen of *C. dorsalis*, Blkb., from Victoria, which is wholly testaceous in colour, and I cannot help suspecting that *C. verticalis* has been founded on immature specimens and is in reality conspecific with *C. dorsalis*. In support of this suspicion it may be noted that the characters of the basal striæ of the elytra do not appear to have been taken into account by M. Putzeys at the time he described *C. verticalis;* under the circumstances there is nothing for it but to retain both names, but, if I am right in my suspicion as to their identity, a want of carefulness on the part of M. Putzeys has saddled the Australian list with at least one name for which no species is likely to be found in nature.

CLIVINA DIMIDIATA, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 39; Ann. Soc. Ent. Belg. 1866, x. p. 185.

The disposition of the colours is almost the same as in *C. basalis*, but the black part is not so large, very oblique from the lateral margin to the suture where it is prolonged beyond the middle of the elytra; the anterior colour instead of being a dull red is a light reddish testaceous; the legs and antennæ are also of a clearer tint. The eyes are less prominent; the prothorax is less narrowed in front, and less emarginate in the middle of the anterior margin; the elytra are shorter and narrower.

Length 7, El. 3·5, breadth $1\frac{7}{8}$ mm.

Australia—Melbourne (?) (Coll. Chaudoir; two specimens).

In addition we learn from the Révision Générale (p. 183) that the central carina of the prosternum is very narrow in *C. dimidiata*. It must greatly resemble *C. melanopyga*, Putz., and

indeed on account of its having the intercoxal part of prosternum very narrow, and from the fact that M. Putzeys his memoir in the Entomologische Zeitung placed *C. melanopy* in the same group as *C. basalis*, taking no notice of the b characters of the striæ of the elytra, I suspect that it is n unlikely to have been founded on specimens of *C. melanopyg* which, probably chiefly on account of their larger size, had be taken to belong to a distinct species.

Section II.

Table of Species.

f. Unicolorous.

g. Size large. .... *C. australasiæ*, Bohem

gg. Size small .... *C. queenslandica*, Sl.

ff. Bicolorous.

h. Black, with apex of elytra reddish ..... *C. leai*, Sl.

hh. Elytra black, with a reddish vitta on each side .... *C. vittata*, Sl.

The species I do not know are *C. juvenis*, Putz., and *C. helm* Blkb.

Clivina australasiæ, Bohemann.

Res. Eugen Coleoptera, 1858, p. 8.

breadth (2·55 × 2·6 mm.), anterior angles rounded, bordered, al basal impressions obsolete, or very faint. Elytra long, lel (6 × 2·8 mm.), lightly convex, dorsal surface rather ssed; base truncate; marginal channel wide at humeral , striæ deep and strongly punctate on disc, becoming faint inely punctate towards apex; interstices convex, except on declivity. Prosternum with intercoxal part narrow orly, sulcate on base; episterna closely rugulose. Anterior strongly 3-dentate, a sinuosity above upper large tooth g a fourth tooth to be weakly developed. ♂ with anterior hardly less strongly dentate than ♀; the inner apical spine and more curved, but not obtuse at apex.

gth 8-10·5, breadth 2·4-2·8 mm.

.: N.S. Wales, Victoria, and South Australia (widely dis-ed); Lord Howe Island (Macleay Museum); New Zealand n).

description given above is founded on specimens sent to Mr. Lea, and taken by him at Windsor, near Sydney; the found on the Murray and Murrumbidgee Rivers seems to a little from the typical form, being a lighter and more x insect, but I cannot find any differences between them re worth considering of even varietal value. The original ption seems inexact in giving the shape of the prothorax as *tudine dimidio longior*," and the elytra, "*prothorace haud a.*" Sometimes the anterior part of the front is densely

C. rugithorax, Putz., in no way differs from *C. australasiæ*, it appears as if *C. rugithorax* should be regarded as a synonym of *C. australasiæ*.

Specimens only 8 mm. in length are rarely found.

Clivina juvenis, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 37; Ann. Soc. Ent. Belg. 1866, x. p. 183.

Subjoined is a translation of Putzeys' entire description. It seems quite useless as a means of identifying any species, and appears to be founded on an immature specimen. The question of whether, in spite of the differences given as distinguishing it from *C. australasiæ*, it may not be that species, I leave for him who can to decide.

Entirely of a slightly reddish testaceous colour. Behind the anterior elevation of the front a wide deep impression is noticed. The impression of the vertex is short and less marked [than in *C. australasiæ*]. The prothorax is narrower, its anterior angles are less rounded; the elytra are a little shorter; the teeth of the tibiæ are finer.

Length 8, El. 4, breadth 2 mm.

Hab. · Melbourne (Coll. Chaudoir).

In addition to the particulars given above we learn from the Révision Générale that the base of the elytra is more distinctly truncate than in *C. australasiæ*.

Clivina queenslandica, n.sp.

[redacted]

depressed rugulose space along anterior margin; wings small, rounded, not divided from median part; clypeal elevation depressed, widely arcuate; a light sinuosity dividing wings from supra-antennal plates ; facial sulci lightly impressed, wide apart, parallel posteriorly; facial carinæ wide, depressed. Prothorax lævigate, subquadrate (1·7 × 1·7 mm.), narrowed anteriorly (ant. width 1·3 mm.); sides lightly rounded; lateral basal impressions distinct, short, narrow. Elytra a little depressed, very little wider than prothorax (3·5 × 1·8 mm.), very little narrowed to base; sides subparallel; shoulders rounded; striæ entire, lightly impressed, finely crenulate; interstices lightly convex on disc, eighth carinate at base and apex. Prosternum with base sulcate; episterna rugulose and transversely striolate. Anterior tibiæ strongly 3-dentate, with a feeble projection above large teeth. ♂ with inner apical spine long, arcuate.

Length 6·2-7; breadth 1·65-1·9 mm.

Hab. : Queensland—Darling Downs District (Lau); South Australia—Lake Callabonna (Zietz).

This species is allied by the form of the anterior tibiæ in the ♂, and the shape of the head to *C. australasiæ*, Bohem., rather than to those species which resemble *C. lepida*, Putz., in these respects, as *C. vagans*, Putz., and *C. dilutipes*, Putz. It is very like *C. dilutipes* in general appearance, but may be distinguished by having the head wider and punctate, eyes less prominent, prothorax more depressed, elytral striæ more finely punctate, prosternum sulcate on base, external teeth of anterior tibiæ stronger; it has even a closer resemblance to *C. occulta*, Sl., but differs in shape of clypeus, shape of prothorax, prosternum with the intercoxal part wider anteriorly, &c.

Clivina leai, n.sp.

Narrow, convex. Head depressed, wide before eyes; prothorax of equal length and breadth, decidedly narrowed anteriorly; elytra strongly punctate-striate, fourth stria outturned and joining fifth at base, a fine submarginal carina at shoulder; anterior tibiæ

strongly 3-dentate. Black; elytra with apical third testac red, under surface piceous; anterior legs piceous brown, four terior legs testaceous.

Head wide before eyes (1·2 mm. × 1·2 mm.), vertex with a shallow rugæ, not punctate except finely on each side near extre of facial carinæ: clypeus not divided from front, lightly and wi emarginate, anterior angles (wings) widely rounded; median depressed, bordered, defined on each side by a short, nar longitudinal ridge; wings small, concave; clypeal elevation tinct, arcuate; supra-antennal plates rather depressed, large, v strongly rounded and bordered externally, projecting sha and decidedly beyond wings of clypeus; facial sulci lig impressed, facial carinæ short, wide; eyes convex, projec slightly, deeply enclosed by supra-antennal plates in fr lightly enclosed behind; orbits abruptly constricted beh Prothorax smooth (a few transverse striolæ on disc), as l as broad (1·8 mm. × 1·8 mm.), widest a little before poste angles, decidedly narrowed anteriorly (ant. width 1·5 mm.), b curve short; border rather wide on anterior part of sides, mec and anterior lines well marked; lateral basal impressions sh distinct. Elytra convex, very declivous on sides, widest a l behind middle (4 × 2·1 mm.), a little narrowed to base; s

distinguishes this elegant species, which was first sent to me by Mr. A. M. Lea, after whom I have named it.

Var. ? *C. apicalis*. A specimen sent to me by Mr. Masters, as coming from N.W. Australia, differs from the type form of *C. leai* by being smaller; the head smooth; the prothorax a little shorter (1·5 x 1·6 mm.), more convex, more rounded on the sides, the lateral basal impressions obsolete; the striæ of the elytra deeper and more strongly punctate.

Length 6, breadth 1·7 mm.

It is probably a distinct species, but requires studying with a number of specimens before one; its general resemblance to *C. biplagiata*, Putz., is very noticeable.

CLIVINA VITTATA, n.sp.

Robust, convex. Front punctate-foveate; prothorax convex, broader than long (1·35 x 1·45 mm.), lightly narrowed anteriorly (ant. width 1·15 mm.). Elytra rounded on sides, widest behind middle, a little narrowed to base (3 mm. x 1·6 mm.), strongly punctate-striate; interstices convex, eighth narrowly carinate at base, and on apical curve. Prosternum with intercoxal part narrow (not attenuate) anteriorly, sulcate on base; episterna finely rugulose-striolate. Anterior femora wide; tibiæ 4-dentate, the upper tooth very feeble. Piceous black; a reddish lateral vitta (interstices 5-7) on each elytron, not reaching apex; legs reddish piceous.

Length 5·3, breadth 1·6 mm.

Hab.: N. S. Wales—Sydney (one specimen sent by Mr. Masters).

A second specimen, labelled Victoria, is in the collection of the Rev. Thos. Blackburn, who has kindly forwarded it to me for examination; it is smaller (4·3 x 1·2 mm.), and has the prothorax piceous red, but otherwise agrees with the type.

This species is allied to *C. sellata*, Putz., but, besides being differently coloured, it differs by its wider and more convex form; wider prothorax; elytra less parallel, more rounded on the

sides, widest behind the middle and evidently narrow shoulders, more widely rounded at apex, intercoxal par sternum wider anteriorly: the clypeus is very similar *C. sellata*, but the wings are smaller and recede a littl the sides, which causes the angles of the median part to b least indicated; the clypeal elevation is less prominent head is less rugulose.

Section III.

Head with space between facial impressions smooth convex; lateral sinuosity between supra-antennal plates an obsolete or hardly marked. Prosternum with intercoxal anteriorly. Anterior tibiæ 3-dentate (in ♂ narrower, and teeth much less developed than in ♀); inner apical s longer than in ♀, curved and obtuse at apex, in ♀ pointe

Table of Species.

i. Bicolorous.

j. Elytra with basal part reddish, apical part black... *C. basal*

jj. Elytra reddish, with a large discoidal plaga... { *C. felix* / *C. exim*

ii. Unicolorous.

k. Prosternum not transversely sulcate on base .

Clivina basalis, Chaudoir.

Bull. Mosc. 1843, iv. p. 733; Putzeys, Mém. Liège, 1863, xviii. p. 38.

Black, base of elytra red (the red part about one-third of elytra in middle of disc and sloping backwards to half the length on each side): legs reddish testaceous. Head smooth, convex, angustate with hardly a perceptible sinuosity on each side before eyes; clypeus not divided from front, anterior margin bordered, widely emarginate, anterior angles rounded. Prothorax convex, smooth, of almost equal length and breadth (1·8 × 1·7 mm.), narrowed anteriorly (ant. width 1·5 mm.); sides lightly rounded; basal curve short; lateral basal impressions well marked. Elytra lightly convex, a little depresed on disc, lightly rounded on sides, not perceptibly narrowed to base (4 × 2 mm.), strongly punctate-striate; the striæ entire, but weaker towards apex, fourth out-turned and joining fifth at base; five inner interstices convex towards base, becoming flat towards apex, eighth distinctly marked on apical curve; a submarginal carina at shoulder. Prosternum with intercoxal part wide anteriorly, transverse sulcus of base obsolete. Anterior tibiæ 3-dentate: in ♂ narrow, first external tooth strong, short, second shorter, projecting but little beyond margin of tibia; inner apical spine elongate, curved and obtuse at apex: in ♀ external teeth much stronger; inner apical spine slender and acute.

Length 5·75-7, breadth 1·6-2 mm.

Hab. : N.S. Wales - Sydney, Tamworth (Lea), Junee, Narrandera, Urana, and Mulwala (Sloane); Victoria; South Australia.

A well known and easily identified species.

Clivina felix, n.sp.

Head and prothorax black; elytra reddish testaceous, with a large ovate black plaga on the posterior two-thirds of disc (not reaching margin), lateral margins and under surface piceous; legs,

antennæ, and palpi testaceous. Facies, head, prothorax, elytra, prosternum, and legs as in *C. basalis*, Chaud.

Length 6-7, breadth 1·5-1·9 mm.

Hab.: Queensland—Port Denison (Masters); N. S. Wales—Junee, Narrandera, Carrathool, Urana, and Mulwala (Sloane); Victoria; South Australia (Blackburn).

This species is rather common in Southern Riverina during the summer months. It resembles *C. basalis* so closely that it may be taken for it at a casual glance, but the colour differentiates it, the black discoidal patch of the elytra in *C. felix* never reaches the margins (as it does in *C. basalis*), but is separated by the testaceous seventh and eighth interstices; on the average it is smaller than *C. basalis*; the only specimens more than 6 5 mm. in length that I have seen have been those from Port Denison. A specimen from Narrandera has the base of the elytra clouded with black. From *C. sellata*, Putz., it differs by its larger size, less cylindrical shape, smooth head, intercoxal part of prosternum not attenuate anteriorly, anterior tibiæ 3-dentate, &c.

CLIVINA EXIMIA, n.sp

Robust, broad, lightly convex. Head as in *C. basalis*, Ch.; prothorax broader than long, basal curve short, lateral basal impressions strongly marked; elytra wide, parallel, truncate at base, punctate-striate, fourth stria outturned and joining fifth at base, interstices convex, eighth carinate at base and apex; anterior tibiæ 3-dentate, with a small protuberance above upper tooth.

(1·8 x 2 mm.), lightly narrowed anteriorly (ant. width 1·7 mm.), convex, declivous to base, finely transversely striolate; sides hardly rounded (nearly straight); posterior angles rounded but marked; anterior margin lightly and widely emarginate; anterior angles obtuse, lightly marked; border narrow, not weaker on sides of basal curve; median and anterior lines strongly impressed; lateral basal impressions short, deep, narrow. Elytra wide (4·5 x 2·4 mm.), lightly convex, subdepressed on disc, shortly declivous to peduncle; base truncate (a little roundly); shoulders rounded; striæ deep, strongly crenulate, becoming lighter towards apex, first stria curving in towards suture a little before base and turning out towards second at basal extremity; interstices convex, depressed posteriorly. Prosternum protuberant; intercoxal part wide anteriorly, sulcate on base; episterna strongly rugulose and transversely striolate.

Length 8, breadth 2·4 mm.

Hab.—North West Australia. (Two specimens sent by Mr. Masters.)

Closely allied to and resembling *C. felix*, Sl., in colour, but larger, wider, and more depressed. The discoidal black patch on the elytra is oval, and extends in its widest part over the four or five inner interstices.

CLIVINA MICRODON, Putzeys.

Ann. Soc. Ent. Belg. 1866, x. p. 183.

Of a slightly duller testaceous colour than *C. juvenis*, the last half of the elytra even more obscure than the base. The antennæ are more slender. The anterior elevation of the head is not declivous and narrowed behind as in *C. juvenis*, where it has the shape of a horseshoe; the vertex has not a central fovea; the prothorax is a little flatter, wider, and the impressions of the base are more marked and rounded towards base. The anterior tibiæ have only two very short and triangular teeth above the apical digitation.

Length 7, El. 3¾, breadth 1¾ mm.

Hab.: Melbourne (Coll. Chaudoir; two specimens.)

The above is a translation of the whole of Putzeys' description of *C. microdon*. I cannot help thinking that it looks not unlike a description founded on an immature specimen of *C. basalis*, Ch., (♂), discoloured with age.

Clivina dilutipes, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 12.

It appears to me likely that M. Putzeys confused two species under this name, viz., the Victorian species which I consider *C. vagans*, Putz., and a species from the coastal districts between Sydney and Brisbane, to which I attribute the name *C. dilutipes*. It is to be regretted that M. Putzeys gave no indication of the differences which divided *C. dilutipes* from *C. vagans*, for it seems not unlikely that both may have been founded on the same species; however, as there appear to be two closely allied species, to either of which either name seems equally applicable, it is probably best to apply the older name, *C. vagans*, to the species which it strikes me as being most fitted to, and then to allot the later name to the remaining species. The resemblance between these two species is very great, the only points of difference apparent to me being that, in *C. dilutipes* the elytra are more deeply striate, with coarser punctures in the striæ, and the prosternum is not sulcate on the base. The following is a description of *C. dilutipes* :—

Narrow, cylindrical. Head small, smooth, lightly bi-impressed; prothorax convex, sides rounded, elytra narrow, strongly punctate-striate, fourth stria joining fifth at base; prosternum with inter-coxal part wide anteriorly, non-sulcate on base; anterior tibiæ

narrowed anteriorly (ant. width 1·35 mm.); lateral basal impressions short, linear, well marked. Elytra narrow (4 × 1·9 mm.), widest a little behind middle; sides subparallel, hardly narrowed to shoulders; base truncate; shoulders rounded, not marked; striæ strongly impressed, deeply punctate, lighter towards apex; interstices convex near base, depressed behind basal third, eighth finely carinate at base and near apex.

Length 6·5-7·5, breadth 1·8-2·2 mm.

Hab.: N. S. Wales—Windsor, Clarence River, and Tweed River (Lea); Queensland—Brisbane (Coates).

The specimens from the Tweed River and Brisbane are darker coloured and have a greater tendency to lose the piceous red patch on the anterior part of the sides than those from the Clarence River.

CLIVINA ANGUSTIPES, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 12.

Narrow, elongate. Black; legs dark piceous; antennæ, palpi, and tarsi ferruginous. Head small, smooth, convex, narrow, angustate without any sinuosity before eyes; clypeus bordered, roundly emarginate; frontal impressions arcuate, deep; eyes convex, prominent. Prothorax longer than broad (1·75 × 1·7 mm.), greatly narrowed anteriorly (ant. width 1·4 mm.), lightly rounded on sides, smooth, convex; anterior angles obtuse; median line lightly impressed; anterior line strongly impressed; lateral basal impressions short, linear, distinct. Elytra a little broader than prothorax (3·8 × 2 mm.), lightly convex, parallel on sides; base truncate; shoulders rounded; striæ moderate, becoming shallow towards apex, strongly punctate (the punctures very fine towards apex), first flexuous near base, fourth outturned and joining fifth at base; interstices lightly convex near base, depressed towards apex, eighth carinate near shoulders, narrowly carinate on apical curve. Prosternum without pectoral ridges; intercoxal part wide at base, angustate but remaining wide anteriorly, transverse sulcus of base lightly marked, sometimes obsolete; episterna rugulose and transversely striolate. Anterior tibiæ narrow,

3-dentate; apical digitation long, lightly arcuate; external teeth short, prominent, inner apical spine as long as apical digitation, truncate, not incrassate.

Length 6·5-7·5, breadth 1·9-2·2 mm.

Hab.: West Australia—Swan River, Newcastle, and Donnybrook (Lea).

Very closely allied to *C. lepida*, Putz., with which it agrees in facies, the head is similar, the prothorax seems a little narrower and longer, the elytra present no differences. The reasons for regarding it as distinct from *C. lepida* are that the prosternum is without pectoral ridges, and not so decidedly (if at all) transversely sulcate on base, and, that the anterior tibiæ differ slightly, their external teeth being longer and more prominent, the apical digitation longer and less obtuse, and the inner apical spine not incrassate at apex.

CLIVINA SIMULANS, n.sp.

Robust, elongate, parallel, subcylindrical Head smooth; prothorax as long as broad, narrowed anteriorly; elytra with fourth stria outturned and joining fifth at base, eighth interstice shortly subcarinate at base, narrowly carinate near apex; anterior tibiæ 3-dentate, ♂ with external teeth much weaker than ♀, and with inner apical spine long, incrassate, obtuse. Black, shining; anterior legs piceous brown; antennæ and four posterior legs ferruginous.

Head smooth, strongly roundly angustate before eyes; the lateral sinuosity between the wings of clypeus and supra-antennal plates hardly perceptible; front and vertex convex, lævigate;

...form a short humeral carina, marginal channel narrowed ...meral angles. Prosternum with pectoral part protuberant, ...coxal part wide anteriorly, non-sulcate on base, episterna ...rging anteriorly, minutely rugulose and finely transversely ...ate.

Length 9.3-10.5, breadth 2.7-2.8 mm.

Hab.—N.S. Wales: Urana District (Sloane; common on the ...ge of the more permanent creeks and swamps).

This species resembles *C. australasiæ*, Bohem., so closely that ...is impossible to distinguish them except by a close scrutiny. ...head is smoother, it is not punctate as is always the case in ...or less degree with *C. australasiæ*, the sinuosity between ...supra-antennal plates and the wings of the clypeus is less ...; the antennæ are a little lighter and slightly less ...; the supra-antennal plates diverge from the head more ...ly before the eyes; the prothorax is more convex, more ...gly narrowed in front, the lateral basal impressions more ...inct; the elytra are more convex, the sides being more ...ous from the fifth stria to the margin, the basal declivity ...greater, the striæ a little more distinctly crenulate, the sub-...ginal humeral carina shorter and less developed, the base of ...prosternum is not sulcate, and the wavy rugulosity of the ...sterna is finer, the external teeth of the anterior tibiæ are ...ter in both sexes (especially in ♂), the upper being smaller ...less outturned, the upper internal spine is longer, straighter, ...acute, the apical spine is lighter in both sexes, and in ♂ ...those at the apex in *C. australasiæ*, though the inner apical ...is longer in ♂ than in ♀, it is bent and pointed at the ...

CLIVINA VAGANS, Putzeys.

...ett. Ent. Zeit. 1866, xxvii. p. 38; Ann. Soc. Ent. Belg. 1866, ...187.

...arrow, convex. Head small, smooth; prothorax smooth, ...r longer than broad; elytra narrow; prosternum with strong ...ral ridges, intercoxal part wide anteriorly, sulcate on base. ...black, shining; legs black, four posterior tibiæ piceous.

♂. Head small, smooth; front and vertex lightly convex; clyp not divided from front, lightly emarginate, wings not divi from median part; supra-antennal plates narrow, not divid from wings of clypeus by a lateral sinuosity; frontal foveæ sma shallow; facial sulci lightly impressed, diverging lightly bac wards; facial carinæ wide, depressed, eyes not prominent. Pr thorax a little longer than broad (2 × 1·9 mm.), evenly conve narrowed anteriorly (ant. width 1·6 mm.); anterior angles lightl rounded, lateral basal impressions shallow, elongate, minutel punctate; median and anterior lines distinctly impressed. Elyt convex (4 × 2·2 mm.); sides lightly rounded, a little narrowed base; shoulders rounded; base truncate; lateral channel narro at humeral angles, striæ lightly impressed, finely punctate, fir entire, others (excepting seventh) becoming obsolete on apic declivity; interstices lightly convex near base, flat on apical ha seventh carinate at base, eighth narrowly carinate near ape Prosternum with pectoral part flat, margined by strong carin these oblique, but becoming parallel at anterior extremit episterna finely rugulose and transversely striolate. Anteri tibiæ narrow; the apical projection short and but little outturne the external teeth feebly developed, the upper not projecti beyond edge of tibiæ; inner apical spine very long, curved, obtu at apex.

[redacted]

but specimens sent me from Swan Hill by Mr. C. French have the four posterior legs testaceous. The black species allied to *C. lepida* require careful study with large series of freshly collected specimens from many different localities.

CLIVINA LEPIDA, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 38; Ann. Soc. Ent. Belg. 1866, x. p. 184.

Narrow, parallel. Head small, smooth; prothorax convex, not broader than long, decidedly narrowed anteriorly (ant. width 1·7 mm.); elytra parallel on sides, punctate-striate, fourth stria out-turned and joining fifth at base. Prosternum with intercoxal part wide anteriorly, sulcate on base; anterior tibiæ 3-dentate; ♂ with teeth of the anterior tibiæ much weaker than in ♀, and with the inner apical spine stout, curved and obtuse at apex. Black, shining; four posterior legs testaceous red, anterior legs piceous.

Head narrow, obliquely angustate, with hardly any trace of a lateral sinuosity on each side behind wings of clypeus, convex and smooth between facial impressions; clypeus not divided from front, anterior margin roundly emarginate, wings small, not divided from median part. Prothorax rather longer than broad (2·2 × 2·15 mm.), sides lightly rounded, not sinuate behind anterior angles; anterior margin lightly emarginate behind neck; anterior angles obtusely rounded; median and anterior lines well marked; lateral basal impressions distinct, linear. Elytra very little wider than prothorax (4·5 mm. × 2·3 mm.), lightly convex; sides parallel, not perceptibly narrowed to shoulders; base truncate; shoulders rounded; apical declivity lightly declivous; striæ more strongly marked and punctate on disc than towards apex; interstices convex towards base, depressed towards apex, seventh shortly carinate at base, eightly finely carinate near apex; lateral border narrow, hardly perceptibly wider posteriorly. Prosternum with pectoral ridges strongly developed; episterna finely rugulose and

transversely striolate. Anterior femora dilatate, upper side very arcuate.

Length 7-8·5, breadth 2·1-2·3 mm.

Hab.: N.S. Wales—Windsor (Lea); New Zealand (Broun).

This species is readily separated from *C. australasiæ*, Bohem., by its smooth head, narrower before eyes, by the weaker external teeth of the anterior tibiæ in both sexes (the fourth tooth is quite obsolete); and by the ♂ having the inner apical spine more curved and obtuse at apex. A specimen sent to me from New Zealand by Capt. T. Broun, under the name of *C. rugithorax*, Putz., is identical in every respect with the ♂ of *C. lepida*; it seems to have been confused with *C. australasiæ* by New Zealand coleopterists. I believe *C. lepida* is also found in Victoria and South Australia.

Var. ? *C. tasmaniensis*, Sl. Coal black, shining, legs black. Differing from *C. lepida* by its darker colour; more convex form; prothorax with lateral basal impressions feebly developed, shallow, short; elytra less parallel, more rounded on sides, striæ less strongly impressed.

Length 7·2-8, breadth 1·9-2·2 mm.

Hab.: Tasmania (sent to me by Mr. A. M. Lea, as from Tasmania).

It requires further study and comparison with *C. vagans*, Putz; it is doubtless the species that Mr. Bates considered *C. vagans* (Cist. Ent. ii. 1878).

Clivina sydneyensis, n.sp.

Robust, convex. Head small frontal sulci diverging back-

marked, obtuse; anterior margin lightly emarginate; lateral basal impressions shallow, linear (sometimes obsolete). Elytra oval ($4 \times 2 \cdot 1$ mm), convex, widest behind middle; sides rounded, decidedly narrowed to base; shoulders not marked; base rounded; striæ narrow, deep on disc, lighter towards apex; their puncturation fine, dense; interstices narrow, convex towards base, eighth finely carinate near apex, a short distinct submarginal carina at shoulder. Prosternum with intercoxal part wide anteriorly, sulcate on base; pectoral ridges well developed.

Length 6·5-8, breadth 1·8-2·2 mm.

Hab.: N.S. Wales—Sydney District (Sloane, Lea).

Very closely allied to *C. lepida*, Putz., but evidently a distinct species. The marked character distinguishing them is the shape of the elytra. In *C. sydneyensis* the elytra are more convex, more deeply and abruptly declivous on base, sides, and apex, the sides are greatly rounded and strongly narrowed to the base, the interstices are narrower and more convex, the fourth being much narrower at the base, the lateral border is wider on the sides, except near the shoulders. From *C. dilutipes*, Putz., which it resembles, it may be distinguished by the more rounded sides of the elytra, and by the presence of a sulcus on the base of the prosternum. From *C. vagans*, Putz., it is separated by the stronger striæ and more convex interstices of the elytra, &c. It appears to be one of the commonest species of Clivina in the neighbourhood of Sydney.

Clivina rubripes, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 13.

The following is a translation of Putzeys' entire note (it cannot be called a description) on this species:—

A little smaller than *C. lepida*. Very distinct by its legs entirely of a red testaceous colour; its prothorax wider, flatter, shorter, nearly quite square, scarcely a little narrowed to the anterior angles, which are a little more rounded; its elytra longer, and its shoulders more marked.

Length 8, El. 4¼, breadth 1¾ mm.

Hab.: Rockhampton (Coll. Castelnau).

CLIVINA ISOGONA, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 13.

"Fusca, elytris pedibusque 4 posticis fusco-testaceis vix emarginatus; vertex in medio oblonge profunde fo antice parum punctatus. Prothorax quadratus parum sulco medio profundo, transversim undulatus neque Elytra cylindrica, basi truncata, humeris rotundatis punctato-striata. Tibiæ anticæ apice digitatæ, extus u denticuloque superiore vix perspicuo armatæ.

"Long. 8, El. 3½*, Lat. 1¾ mm."

I translate the remarks which follow, as under:—I and general appearance it comes near *C. rubripes*, but are a little longer and the shoulders less rounded; the is shorter, still less narrowed in front, a little less co median line is more deeply impressed and the surface b more distinct undulate striæ; the two impressions of th less marked.

The vertex bears in the centre a deep oblong fove preceded by some large scattered punctures. The e much less emarginate and more strongly bordered in t

CLIVINA PECTORALIS, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 14.

Robust, convex; prothorax broader than long; elytra oval with base truncate, crenulate-punctate, fourth stria joining fifth at base, submarginal humeral carina hardly developed; prosternum with intercoxal part sharply narrowed, not attenuate anteriorly, sulcate on base, episterna finely punctate; anterior tibiæ strongly 3-dentate. Head, prothorax, legs, suture and lateral margins of elytra reddish brown; elytra piceous brown.

Head not large, punctate between posterior extremities of supra-orbital carinæ; vertex and front convex: clypeus not divided from front, anterior margin widely emarginate, bordered; wings not divided from median part, widely rounded; supra-antennal plates convex, rounded externally, projecting strongly and sharply beyond wings of clypeus; frontal foveæ large, wide; facial carinæ wide, merely a backward prolongation of the supra-antennal plates; facial sulci wide, divergent; eyes convex, not prominent; orbits prominent and convex behind. Prothorax finely shagreened, convex, widest a little before posterior angles (1·3 x 1·35 mm.), narrowed anteriorly (1·1 mm.); sides short, evenly rounded; anterior margin emarginate; angles obtuse; posterior angles marked; median line strongly impressed: anterior line lighter. Elytra wider than prothorax (2·9 x 1·6 mm.), oval; shoulders rounded, not marked; striæ entire, deeply impressed, finely crenulate, seventh not interrupted at beginning of apical curve; a short distinct striole at base of first interstice; interstices convex, minutely shagreened, eighth broad, hardly carinate near apex. Intermediate tibiæ with external margin spinulose, the spine nearest the apex a little stronger than others.

Length 4·5-5·2, breadth 1·35-1·6 mm.

Hab.: Queensland — Rockhampton (Coll. Castelnau); N.S. Wales—Clarence River (Lea); West Australia (sent by Mr. French, probably from N.W. Coast).

A completely isolated species among the Australian members of the genus. The external spur of the intermediate tibiæ is very weak and situated not far from the apex.

The description given above is founded on specimens (♀?) from the Clarence River, sent to me by Mr. Lea, which, although appearing to differ slightly from M. Putzeys' description of *C. pectoralis* in having the puncturation of the head, prothorax, and prosternal episterna weaker, seems undoubtedly that species. One specimen (♂ probably), of which only the elytra now remain, is much smaller (4·5 mm.), differently coloured—the elytra being black, with the suture and lateral border reddish—the puncturation of the metasternum and ventral segments stronger, and the ventral segments foveate laterally. In the specimen described above, the puncturation of the prothorax is so obsolete as to require a powerful lens to distinguish it; the metasternum is finely punctate near the sides, also the episterna, and the ventral segments are without punctures or lateral foveæ. A specimen sent to me by Mr. French, as from West Australia, is of an entirely ferruginous colour.

Procera group.

Size large, or above the average. Clypeus truncate-emarginate (median part truncate, wings projecting strongly forward, and roundly obtuse at apex). Elytra with fourth and fifth striæ confluent at base, a submarginal carina at shoulder (sometimes feebly developed, *e.g.*, *C. nyctosyloides*, Putz.). Prosternum with intercoxal part very wide anteriorly, not sulcate on base. Anterior

Table of Species known to me.

A. Lateral cavities of peduncle punctate or rugulose.

B. Metasternal episterna elongate (metasternum between intermediate and posterior coxæ longer than posterior coxæ).

C. Prothorax not longer than broad, mandibles short .... *C. procera*, Putz.

CC. Prothorax longer than broad, mandibles decussating (antennæ very short, moniliform) .... *C. monilicornis*, Sl.

BB. Metasternal episterna very short (metasternum between intermediate and posterior coxæ shorter than posterior coxæ).

D. Head with a strong transverse occipital impression .... *C. oblonga*, Putz.

DD. Head without a transverse occipital impression (or at most only lightly indicated on sides).

E. Head without a noticeable lateral sinuosity between supra-antennal plates and wings of clypeus. Prosternal episterna rugose on basal declivities .... *C. abbreviata*, Putz.

EE. Head with a decided lateral sinuosity between supra-antennal plates and wings of clypeus. Prosternal episterna smooth on basal declivities *C. macleayi*, Sl.

AA. Lateral cavities of peduncle smooth.

F. Prothorax not broader than long, normally narrowed anteriorly .... *C. regularis*, Sl.

FF. Prothorax broader than long, greatly narrowed anteriorly.

G. Mandibles short.

H. Elytra with striæ deep, entire, strongly punctate; antennæ subfiliform, second joint decidedly longer than third...... *C. nyctosyloides*, Putz. / *C. interstitialis*, Sl.

HH. Elytra smooth on sides and apex; antennæ filiform, third joint not shorter than second.

I. Striæ of elytra simple, interstices not convex .... *C. masteri*, Sl.

II. Striæ of elytra punctate, interstices convex on anterior part of disc..... *C. ovipennis*, Sl.

GG. Mandibles long, decussating.

K. Elytra with testaceous margin ... *C. marginata*, Putz.

KK. Upper surface entirely black .. *C. gracilipes*, Sl.

Clivina procera, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 34; Ann. Soc. Ent. Belg. 1866, x. p. 180; *Scolyptus procerus*, l.c. xi. p. 8.

A widespread and well known species; the following diagnosis will enable it to be identified :—

Elongate, parallel, subcylindrical. Black, shining; legs piceous. Head smooth, lateral margin sloping obliquely and evenly forward from a little before the eyes: clypeus not divided from front; median part truncate; wings strongly advanced, rounded at apex; facial sulci lightly impressed; eyes prominent, lightly enclosed behind. Mandibles short. Antennæ not short, submoniliform, lightly compressed. Labrum 5-setose. Prothorax subquadrate (4 × 4·1 mm.), lightly convex, narrowed anteriorly (ant. width 3·3 mm.),

much weaker in ♂ than in ♀); inner apical spine in ♂ very long, stout, incurved and truncate at apex.

Length 13·5-17, breadth 3·75-4·7 mm.

Hab.: Queensland—Burketown District (French), Rockhampton (Coll. Castelnau); N.S. Wales—Murray and Murrumbidgee Rivers; Victoria; South Australia.

Note.—A specimen in the possession of Mr. Masters from Port Darwin is of the following dimensions:—Head 3·5 × 3·5, prothorax 5·25 × 5·3, elytra 13·5 × 6, length 22 mm. It is the largest Clivina I have seen, but, beyond its apparently heavier build, I cannot differentiate it from *C. procera*.

CLIVINA PROMINENS, Putzeys.

Stett. Ent. Zeit. 1866, xxvii. p. 35; Ann. Soc. Ent. Belg. 1866, x. p. 182; *Scolyptus prominens*, l.c. 1868, xi. p. 8.

Putzeys' whole description is in three lines as under:—

Very near *C. procera*, of which it is perhaps only a variety. It is smaller; the prothorax is a little shorter and less broad posteriorly; the elytra are a little narrower at the apex, and the eyes are more prominent.

Length 13½, El. 7, Lat. 3 mm.

Hab.: Australia—Melbourne (Coll. Chaudoir; two specimens sent by Mr. Bakewell).

CLIVINA MONILICORNIS, n.sp.

Cylindrical, subparallel. Head short, subdepressed; mandibles not long, decussating; clypeus emarginate-truncate; antennæ short, moniliform: prothorax longer than broad, narrowed anteriorly; elytra very convex, crenulate-striate, fourth stria joining fifth at base, eighth interstice very narrowly carinate near apex, a submarginal carina at shoulder; prosternum with intercoxal part wide anteriorly, lateral cavities of peduncle deep, finely punctulate; metasternal episterna of medium length; anterior tibiæ strongly 3-dentate. Black, under surface piceous black, legs piceous.

Head short (1·6 × 1·8 mm.), wide before eyes; vertex and front smooth, wide, lightly convex; clypeal elevation prominent, rounded: clypeus divided from front by a strong transverse impression, depressed near anterior margin; median part truncate, bordered; wings strongly advanced, rounded externally, very obtuse at apex, oblique on inner side; supra-antennal plates wide, rounded externally, a light sinuosity dividing them from clypeal wings; eyes globose, prominent, projecting lightly beyond supra-antennal plates; orbits narrow and abruptly constricted behind; facial sulci diverging backwards from ends of clypeal suture; facial carinæ thick, prominent. Labrum 5-setose. Palpi stout; penultimate joint of labial about same length as terminal. Antennæ with second joint decidedly longer than third, joints 4-10 short, quadrate. Prothorax smooth, longer than broad (3 × 2·8 mm.), narrowed anteriorly (ant. width 2·3 mm.), very convex transversely, lightly convex longitudinally, very declivous to base; anterior margin subtruncate (lightly emarginate behind neck); anterior angles obtuse, hardly marked; posterior angles rounded; basal curve short; border narrow; median and anterior lines lightly impressed; lateral basal impressions distinct, round, foveiform. Elytra very convex, suboval (6 × 3 mm.), lightly rounded on sides, widely rounded at apex, very declivous to humeral angles, these rounded; striæ finely crenulate, strongly impressed on disc, weaker towards apex and sides, seventh hardly marked; interstices convex near base, becoming depressed towards apex, first of each elytron together forming a wide lightly raised sutural ridge, the four large punctures of third interstice stronger

an anomalous species; the arrangement of the striæ at the apex of the elytra and the form of the clypeus associate it with *C. procera*, Putz., and *C. abbreviata*, Putz.; probably it is more nearly allied to *C. abbreviata*, Putz., than to any other species known to me, but the longer metasternal episterna seem to preclude its being put with that species. The metasternal episterna are much shorter than in *C. procera*, being very little longer than in *C. grandipes*, Sl., *C. emarginata*, Putz., or *C. nyctosyloides*, Putz., but much narrower, especially in front, than in those species.

Clivina elegans, Putzeys.

Mém. Liége, 1863, xviii. p. 44; Stett. Ent. Zeit. 1866, xxvii. p. ; Ann. Soc. Ent. Belg. 1866, x. p. 179.

"Nigra, nitida, palpis tarsisque testaceis, labro, antennis pedibusque brunneis. Clypeus truncatus, alis angulatim prominentibus. Pronotum planiusculum, oblongo-subquadratum, antice angustatum, a basi rotundatum, angulis posticis nec prominulis. Elytra elongato-oblonga, punctato-striata, interstitio 3° quadripunctato. Tibiæ anticæ sulcatæ extus fortiter bidentatæ, intermediæ calcaratæ.

"Long. 15, El. 8, Lat. 4 mill."

The above is M. Putzeys' original diagnosis; it is followed by a long description which, only omitting a few unimportant details, may be thus translated:—

The antennæ are short, rather thick, incrassate, moniliform from the fifth joint.

The mandibles are short, broad, particularly at the base, rather strongly arcuate, not very acute at apex.

The epistoma is very lightly sinuate, closely united to its wings which project strongly in an acute angle, the apex of which is obtuse; the wings are less than usually divided from the supra-antennal plates. The anterior elevation has posteriorly a broad depression, which decreases a little in depth at the centre and at the sides. The whole head is finely punctate. On the vertex a hardly noticeable small impression is seen, and a little further forward on the sides two transverse impressions, which extend a

little backwards. The eyes are not very prominent, their posterior third being embedded in the lateral margin of the head. The impression which divides the head from the neck is hardly marked in the middle.

The prothorax is quadrate, a little longer than broad, narrowed anteriorly, very rounded at the posterior angles, not much prolonged posteriorly; the surface is lightly convex, the anterior margin is widely emarginate; the angles are a little prominent; the sides, cut obliquely for their first half, are regularly curved to the base; the posterior angles form no prominence; only a large internal puncture is seen above a tubercle, which does not project beyond the marginal border. The transverse anterior impression is rather close to the margin; the longitudinal impression extends a little past the first. In the middle of each side of the prothorax, facing the posterior angles, a rather wide shallow fovea is noticed, which extends forward in a straight impressed and more marked line, reaching beyond the anterior third of the prothorax.

The elytra form a very elongate regular oval; their upper surface is depressed longitudinally along the suture on the anterior third; the striæ are punctate, but the interstices are not raised. It is a prolongation of the seventh interstice, which at the shoulder unites with the marginal border; only the interstices 1-3 touch the base.

The anterior tibiæ are wide, sulcate on upper side; externally they have a rather long strong tooth, and above this a second short and broad tooth. The intermediate tibiæ are wide, spinose along the posterior side, which is armed with a spur.

... in front, its elytra more convex, of a very regular ...ngate-oval shape, its striæ deeper, the under surface of the ...thorax finely striolate-punctate, and particularly by the ...asternal episterna, which are short and square; the paronychium ... little longer.

...he central carina of the prosternum is broad, canaliculate ... between the coxæ

... Putzeys also says that he had possessed this insect a long ..., and that it was given to him as coming from South America. ...he greater part of its features show an affinity to the Aus...n species he adds that he suspects that this country may be its true habitat.

...e impression left upon my mind by a study of Putzeys' ...iption, with specimens of *C. oblonga*, Putz., before me, is ... it may well have been founded on a specimen (♀) of that ...s, and it is to be regretted that M. Putzeys when describing ...*longa* did not compare it with *C. elegans*. The only features ...separate these species seem to be the punctate striæ and the ...stices not raised, with the striolate-punctate under surface of ...*gans*; however, a specimen of *C. oblonga*, referred to under ...species as identical with *Ceratoglossa foveiceps*, Macl., (*vide* ...5), presents elytral characters that might be described as are ... of *C. elegans*. It is possible the fine punctures of the head ...nder surface may be a *post mortem* effect; still, as M. Putzeys ...led the species he named *C. oblonga* as undescribed, his ...n, must, I think, be upheld, though not without doubt on

Robust, elongate-oval. Head strongly transversely impress behind vertex; antennæ moniliform; mandibles short: elytr oblong-oval; striæ deep, entire; lateral cavities of peduncl punctate; metasternum and metasternal episterna short; anteric tibiæ 3-dentate. Black, shining; under surface minutely sha reened.

♀. Head smooth, narrowed to a neck behind eyes; latera margins sloping obliquely and evenly forward from a littl before eyes; a deep oblique impression dividing clypeus o each side from supra-antennal plates -these impressions som times turning inwards and dividing the clypeus from the front each side: clypeus not divided from front in middle, conve declivous to anterior margin; this bordered, deeply truncat emarginate; wings concave, strongly advanced, widely rounded apex, sloping gently to median part on inner side; supra-antenn plates large, convex, not divided from the wide convex faci carinæ; facial sulci strongly impressed; eyes convex, deepl enclosed in orbits; these large, strongly protuberant (abo two-thirds size of eyes) behind eyes; supra-orbital punctur distant from eyes; temporal region strongly rugulose; gul finely rugulose. Antennæ stout, moniliform, incrassate: join 5-10 short, strongly compressed. Palpi with apical joi thick, oval. Prothorax smooth (faint transverse striolæ notic

sternum with intercoxal part channelled, wide anteriorly, almost vertical and non-sulcate on base; pectoral carinæ weakly developed, widely divergent anteriorly. Metasternum much shorter between intermediate and posterior coxæ than length of posterior coxæ. Legs in every way similar to those of *C. procera*.

Length 13·5-16, breadth 3·8-4·6 mm.

Hab.: N. S. Wales—Richmond River (Macleay), Narrara Creek (Sloane), Burrawang (Fletcher).

Allied to *C. abbreviata*, Putz., from which the strong transverse occipital impression, which is characteristic of *C. oblonga*, at once separates it.

The number of punctures on the third interstice of the elytra varies from four to five; the posterior puncture in *C. oblonga* is deep and placed opposite the extremity of the fourth interstice, and is much nearer the apex than in any other of the large species of *Clivina* from Australia. The form of the apical extremities of the third and fifth interstices is worthy of note—these interstices are strongly raised and confluent at their apices, the apex of the fourth interstice terminating in a rather deep depression formed by this union of the third and fifth.

A specimen (♀) is in my collection which I have compared and found identical with the type of *Ceratoglossa foveiceps*, Macl. It is larger (16 × 4·6 mm.) and more convex than typical specimens of *C. oblonga*, has the prothorax a little shorter (3·8 × 3·8 mm.), the striæ of the elytra distinctly crenulate, and the posterior large puncture of the third interstice a little further from the apex; but I cannot think it a different species. The name *foveiceps* was preoccupied in *Clivina* when Sir William Macleay bestowed it on his species; the later name *oblonga* therefore has to be adopted.

Clivina abbreviata, Putzeys.

Scolyptus abbreviatus, Putz., Ann. Soc. Ent. Belg. 1873, xvi. p. 10.

This species agrees with *C. oblonga*, Putz., in most features; the head is similar, excepting that the transverse occipital impression is

wanting; the metasternum and its episterna are similar; t are similar, but the external teeth of the anterior tibiæ ar stronger. The following brief description will enable it recognised :—

Black, legs piceous, or reddish. ♂. Prothorax as long as (3·1 × 3·1 mm), decidedly narrowed anteriorly (ant. wic mm.), lightly convex; sides lightly rounded; basal curve anterior margin emarginate; anterior angles lightly adv widely rounded. Elytra oval (6·5 × 3·4 mm,); striæ and inte as in *C. oblonga*, eighth interstice feebly and shortly c near apex. Prosternum as in *C. oblonga*, the pectoral more strongly developed. Anterior tibiæ 3-dentate, the e teeth strong. Under surface minutely shagreened.

Length 12·5-13·5, breadth 3·4-3·8 mm.

Hab. : Queensland—Wide Bay District (Spencer, Maste

Note —In the specimen before me, the third interstice h punctures on each elytron, the three anterior ones not placed quite similarly on each elytron. In *C. abbreviata* t terior puncture is placed at the beginning of the apical de not on the declivity at the junction of the third and fourtl as in *C. oblonga*, Putz.

divided from front by an irregular shallow impression, this impression obsolete in middle, median part not divided from wings, truncate; wings advanced, rounded at apex and externally, inner side gently oblique; supra-antennal plates short, wide, rounded externally, projecting strongly beyond clypeal wings; eyes deeply embedded in orbits behind, small, convex, hardly more prominent than supra-antennal plates, orbits projecting strongly from sides of head behind eyes; facial carinæ strongly developed, converging roundly in front and reaching clypeus. Mandibles short. Labrum 5-setose. Labial palpi stout, penultimate joint not longer than terminal, this thick, obtuse at apex. Antennæ short, moniliform, third joint shorter than second, joints short, quadrate. Prothorax subquadrate (2·3* × 2·45 mm.), widest just before posterior angles, a little narrowed anteriorly (front width 2·15 mm.), convex, very declivous to base, sides straight and widely sinuate, rounded to anterior angles; anterior margin widely and deeply emarginate; anterior angles distant from neck, obtuse but marked; posterior angles rounded, not marked; basal curve very short; lateral channel well developed; median line strongly impressed, reaching base; anterior line distinct, very near margin; border narrow, not upturned at anterior angles. Elytra oval (4·5 × 2·5 mm.), widest a little behind middle; sides strongly rounded; shoulders rounded, apex widely rounded; striæ deep, simple, seventh hardly less deeply impressed than others. Prosternum with intercoxal part wide posteriorly, non-sulcate on base; episterna very feebly transversely sulcate, overhanging near anterior angles. Anterior femora short, wide, strongly arcuate above, rounded not channelled below; tibiæ rather wide, apex short, wide, curved, first external tooth wide, prominent, upper tooth wide, not prominent, inner apical spine thick, truncate, longer than apical digitation (as long as three basal joints of tarsus), upper internal spine finely

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* This is the length in the middle; from anterior angle to base the length about equals the breadth.

acuminate; intermediate tibiæ with outer edge spinulose, th external spur prominent and placed considerably before the apex

Length 9, breadth 2·5 mm.

Hab.: Queensland—Port Darwin, Roper River (sent by Mr Masters).

A very distinct species, in general appearance much resemblin a small species of *Promecoderus*. Its affinity is to *C. abbreviat* Putz., but it differs greatly from that species by its smaller siz head much wider in front of eyes, more strongly rounded (strong sinuosity behind wings of clypeus) to anterior angles, th facial carinæ long, incurved, forming a border to the inner sid of the supra-antennal plates, eyes more deeply enclosed in orbits these more abruptly constricted behind; prothorax more quadrat the sides sinuate, the basal curve still shorter; prosternum wit intercoxal part not bisulcate, &c.

CLIVINA REGULARIS, n.sp.

Robust, parallel. Head as in *C. procera;* clypeus deepl emarginate-truncate; prothorax as long as broad, lightly narrowe anteriorly; elytra parallel, simply striate, striæ deep on disc, wea on sides, interstices convex on disc, eighth feebly indicated nea apex, submarginal humeral carina short; prosternum with inte coxal part very wide anteriorly, episterna smooth, lateral cavitie

anterior lines strongly impressed; lateral basal impressions elongate, very shallow. Elytra truncate-oval (6·2 × 3 mm.), a little narrowed to base, very convex, sides rounded; apex widely rounded; base truncate, shoulders rounded; striæ obsoletely crenulate, four inner ones very strongly impressed, weaker towards apex; fifth, sixth and seventh successively weaker (seventh very faint); five inner interstices convex, seventh and eighth united at base and forming a short, rather broad and lightly raised carina at humeral angle. Legs stout; anterior trochanters not projecting at base of femora; tibiæ with apical digitation very thick, two external teeth short, thick, prominent, inner spine longer than apical digitation, obtuse at apex; external and intermediate tibiæ as in *C. australasiæ*.

Length 11·5, breadth 3 mm.

Hab. New South Wales—New England.

Two specimens, both apparently ♂, were sent to me by Mr. [illegible]. A very distinct species: in general appearance it resembles *C. australasiæ*, Bohem., but the smooth prosternal episterna and peduncle, the emarginate-truncate clypeus, &c., show it to be allied to *C. procera*, Putz., and *C. oblonga*, Putz.; probably its nearest ally is *C. moniliformis*, Sl., with which it is connected by the length of the metasternal episterna, but its antennæ, though moniliform, are longer, the head is larger, with larger supra-antennal plates, the prothorax is shorter, less strongly narrowed anteriorly, and without the rounded basal foveæ of *C. moniliformis*, the elytra are less convex. From *C.* [illegible], Sl., it is readily distinguished by its thicker antennæ, the form of the [illegible], elytra more rounded on sides, the striæ not punctate, the metasternal episterna not rugulose on the basal declivities, &c.

CLIVINA NYCTOSYLLOIDES, Putzeys.

Ann. Soc. Ent. Belg. 1868, xi. p. 10.

Oval, robust, convex. Head large, eyes prominent; prothorax transverse, subtrapezoid, very convex; elytra oval, deeply punctate-striate, striæ entire, fourth joining fifth at base, interstices convex,

eighth interrupted at beginning of apical curve, very narrowl carinate near apex, submarginal humeral carinæ obsolete; pr sternum with intercoxal part very wide anteriorly, lateral cavitie of peduncle smooth, wide, shallow; anterior tibiæ 3-dentat external spur of intermediate tibiæ oblique and near apex Black, legs piceous, antennæ and tarsi reddish.

Head large (1·8 × 2·2 mm.), smooth between lateral impre sions; a punctiform impression in middle between eyes; a stron lateral sinuosity between wings of clypeus and supra-antenn plates. clypeus not divided from front, depressed along anteri margin; median part truncate; wings concave, strongly advance beyond median part, roundly obtuse, oblique on inner side; thro very convex, gulæ with a few faint wavy striolæ; eyes conve prominent, enclosed on lower side posteriorly. Labial palpi stou penultimate joint about same length as terminal, this stou fusiform, truncate. Antennæ not long, lightly compressed, no incrassate; second joint decidedly longer than third. Prothora smooth, transverse (3·2 × 3 5 mm.), widest a little before posteri angles, greatly narrowed anteriorly (ant. width 2·5 mm.), round on sides, evenly convex, gently and roundly, but deeply decliv to base; anterior angles obtuse; posterior angles obtuse, bu marked; border thick, widened at and passing round anteri angles; median line deeply impressed; anterior line distinct an

... apex pointing obliquely downwards.

Length 13, breadth 4 mm.

Hab. Queensland—Rockhampton (Coll. Castelnau), Dawson River (Barnard).

M. Putzeys formed a separate group for the reception of this species, but I have placed it among the large assemblage of species which I term the "*procera group*," in which it is the representative of a distinct section. Putzeys describes the inner apical spine of the anterior tibiæ as equalling in length the apical digitation, not diminishing in width and truncate at apex in the ♂, and acuminate in the ♀; I only know the ♀, in which it does not actually equal the apical digitation in length.

The elytra (only) of a specimen are in my collection received from the late Mr. G. Barnard from Coomooboolaroo, Dawson River, in which the fourth stria is free at the base.

Clivina interstitialis, n.sp.

...al, robust, convex. Head convex, eyes convex; prothorax transverse, subtrapezoid, longitudinally convex; elytra ovate, wide, ...y punctate-striate, fourth stria joining fifth at base, interstices very convex, eighth interrupted at beginning of apical ..., finely carinate near apex, submarginal carinæ of shoulders ...ete; prosternum with intercoxal part bisulcate, wide ...teriorly, non-sulcate on base; episterna smooth, not overhanging in front; lateral cavities of peduncle wide, very shallow, not ...

truncate; wings concave, strongly advanced beyond median part obtusely rounded anteriorly; gulæ convex, hardly at all rugulose. Labial palpi with penultimate joint stout, rather short, about same length as terminal; this wide and obtuse at apex. Antennæ with third joint shorter than second; joints 4-11 short, hardly compressed. Prothorax smooth, transverse (2·6 mm. × 2·9 mm.) widest a little before posterior angles, greatly narrowed anteriorly (ant. width 2 mm.), very convex, strongly and roundly declivous to base; sides rounded; anterior angles obtuse; posterior angles obtuse, but marked: basal curve short; border thick, wide and reaching neck at anterior angles: median line weak; anterior line strongly impressed; lateral basal impressions obsolete. Elytra ovate (5·5 × 3·5 mm.); striæ deep, entire, very coarsely punctate on disc; interstices subcarinate for whole length, narrow and more carinate on apical declivity.

Length 10, breadth 3·5 mm.

Hab.: Queensland Cooktown (from Mr. French).

This species agrees in all points of structural detail with *C. nyctosyloides*, Putz., of which it may possibly be a marked variety though I regard it as a distinct species. The following differences from *C. nyctosyloides* may be noted; the smaller size; more convex form; more elongate head, prothorax more convex, narrower, more

prosternum with intercoxal part wide anteriorly, bisulcate between coxæ, non-sulcate on base; episterna smooth, hardly overhanging anteriorly; metasternal episterna short; lateral cavities of peduncle feebly developed, impunctate: anterior tibiæ slender, 3-dentate; intermediate tibiæ narrow, external spur short, placed at apex. Black, antennæ and tarsi piceous red.

♂. Head rather large (2·7 × 3 mm.), convex, smooth, obsoletely and widely transversely impressed behind facial carinæ; sides obliquely narrowed and widely sinuate before eyes: clypeus not divided from front, declivous; median part wide, truncate: wings narrow, impressed, strongly and obtusely advanced; facial impressions strongly impressed, sinuate; facial carinæ short, wide, convex, not greatly raised; eyes prominent, strongly enclosed by orbits on posterior part of lower side. Palpi filiform; labial with penultimate joint not longer than terminal. Antennæ filiform, third joint not shorter than second. Prothorax nearly as long as broad (4·5 × 4·6 mm.), widest a little behind middle, greatly narrowed anteriorly (ant. width 3 5 mm.), roundly and deeply declivous to base; sides oblique, hardly rounded; anterior margin lightly emarginate; anterior angles rounded; posterior angles rounded; border thick, hardly reflexed on sides, weaker behind posterior angles, extending round anterior angles to neck; median line linear, distinct; anterior line lightly but decidedly impressed; lateral basal impressions shallow, wide, distinct. Elytra oval (10·5 × 5·5 mm.), convex; sides rounded; shoulders rounded, not marked; striæ simple, four inner ones strongly impressed towards base, first entire, joining second at base, others not reaching apex, successively shorter, fourth not outturned at base, fifth inturned to meet fourth at base, sixth and seventh obsolete; three inner interstices lightly convex near base, sutural interstice of each elytron separately convex on basal third, after that together forming a lightly raised sutural ridge; lateral border narrowly reflexed, reaching nearly to peduncle at base. Anterior femora thick, hardly compressed, lower side rounded; tibiæ slender, apical digitation long, narrow, curved, obtusely pointed, first external tooth prominent, triangular, second obtuse, feebly developed,

middle of lower side greatly raised and forming a prominent triangular tooth above upper internal spine, inner apical spine about as long as apical digitation, cylindrical, curved, obtuse; upper spine long, slender, very acuminate; four posterior legs light.

Length 19, breadth 5·5 mm.

Hab. : Queensland—Port Darwin.

A single specimen of this fine species was sent to me for description by Mr. G. Masters. Excepting a specimen sent to me by Mr. Masters as from Port Darwin, which I cannot separate from *C. procera*, Putz., this is the largest Clivina I have seen. It represents a distinct section, its nearest ally being *C. ovipennis*, Sl., which agrees with it in facies, and in form of metasternal episterna and legs.

Clivina ovipennis, n.sp.

Elongate-oval, robust, convex. Head obsoletely impressed on each side behind vertex; prothorax greatly narrowed anteriorly: elytra oval, smooth on sides and apex; four inner striæ deeply impressed and coarsely punctate on basal half; eighth interstice obsolete on apical curve; a very feebly developed submarginal carina at shoulder: prosternum with intercoxal part bisulcate, very wide anteriorly, non-sulcate on base; episterna smooth, not

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facial carinæ raised; eyes globose, prominent; orbits feebly ...ed just behind eyes. Mandibles short. Antennæ stout, long, ...iliform; third joint not shorter than second, joints 5-10 oblong, hardly compressed. Prothorax smooth, of equal length and breadth (3·5 mm. × 3·5 mm.), widest a little before posterior angles, greatly narrowed anteriorly (ant. width 2·6 mm.), convex, ...ly and deeply declivous to base; sides rounded, posterior angles rounded, anterior margin lightly emarginate, angles rounded; basal curve short; border narrow, reflexed on sides, extending round anterior angles to neck; median line lightly impressed, anterior line strongly impressed; lateral basal impressions lightly marked, elongate. Elytra oval (8 × 4·1 mm.), strongly and evenly convex, a wide smooth space on sides and apex; base truncate between shoulders; humeral angles rounded off, not the least marked; striæ deeply impressed and strongly crenate on basal half of disc, first entire, joining second at base, none of the others attaining apex, successively shorter towards sides, fourth joining fifth but not outturned at base, first interstice of each elytron together forming a convex ridge for whole length of suture; interstices 2-4 convex towards base, flat on apical half, 6-8 not divided from one another, sixth finely carinate at base; border reflexed, reaching very nearly to peduncle. Metasternum and its episterna short (distance between intermediate and posterior coxæ a little shorter than length of posterior coxæ). Ventral segments smooth. Anterior femora stout, not channelled below; tibiæ narrow, first external tooth short, wide, projecting, second a mere obtuse prominence, inner apical spine very long, narrow, truncate.

Length 14, breadth 4·1 mm.

Hab. North Queensland. (A single specimen given to me by Mr. C. French).

The type specimen is evidently the ♂. *C. ovipennis* is allied to *C. mastersi*, Sl., which it resembles in general appearance; the chief differences being its smaller size, prothorax slightly shorter and more narrowed in front, elytra with deeper and strongly

punctate striæ on the basal part of disc, the interstices muc more convex, the suture not impressed near the base, &c.

Clivina marginata, Putzeys.

Scolyptus marginatus, Putz., Ann. Soc. Ent. Belg. 1868, xi. p.

♂. Black; sides of elytra for posterior two-thirds, (exceptic border) apex and legs testaceous red; antennæ and palpi testaceou Robust, convex. Head smooth, convex, not transversely impress behind vertex; front depressed: clypeus not divided from fro median part wide, truncate; wings shortly but decidedly advance widely rounded at apex; frontal impressions lightly impresse facial carinæ feebly developed Mandibles long, decussatin Palpi long, filiform; penultimate joint of labial rather longer tha terminal, of maxillary as long as terminal. Antennæ filifor third joint not shorter than second. Prosternum a little broade than long (3·8 × 4 mm.), greatly narrowed anteriorly (ant. widt 3·1 mm.), smooth, convex, roundly and deeply declivous to bas basal curve short; sides hardly rounded; anterior margin lightl emarginate; anterior angles obtuse; posterior angles rounded, b marked; border extending round anterior angles, median li lightly impressed; anterior line strongly impressed; lateral bas impressions distinct, wide, shallow. Elytra wide, oval (8·8 × 5 mm.) five inner striæ strongly impressed, lightly crenulate, first entir

side; tibiæ 3-dentate, narrow, apex short, lightly curved, first external tooth short, triangular, prominent, upper feebly developed, middle of lower side of tibia forming a ridge and ending in a strong triangular tooth near upper internal spine; inner apical spine about twice as long as apical digitation, thick and very obtuse at apex, upper spine slender, finely acuminate; four posterior legs long, light; intermediate tibiæ narrow, external spur very near apex, short, oblique.

Length 15·5, breadth 5 mm.

Hab.: Queensland—Port Denison (Masters).

The description given above is founded on a specimen kindly lent to me by Mr. Masters. This species may be considered the type of a separate section consisting of *C. marginata* and *C. gracilipes*, Sl. The following will be the characteristic features of this section :—Mandibles decussating; clypeus with median part truncate, the wings shortly but decidedly advanced; antennæ filiform, third joint as long as second: palpi long, filiform, the labial with the penultimate joint longer than the terminal; maxillary with penultimate joint about as long as terminal; prothorax widest near posterior angles and greatly narrowed anteriorly, posterior angles marked; prosternum wide between the coxæ, the sides not overhanging in front; metasternal episterna shorter and much wider than in *C. australasiæ*, Bohem., but longer than in *C. oblonga*, Putz.; legs light, external spur of intermediate tibiæ small and placed almost at apex, the tarsi long, slender.

CLIVINA GRACILIPES, n.sp.

Elliptic-oval. Head small; mandibles decussating, labial palpi with penultimate joint long, slender: prothorax subtrapezoid; elytra widely ovate, crenulate-striate; fourth stria joining fifth at base, seventh obsolete; eighth interstice shortly carinate at base, not indicated on apical curve; prosternum with intercoxal part bisulcate, very wide anteriorly; lateral cavities of peduncle smooth, shallow: legs light; anterior tibiæ narrow, 3-dentate; intermediate tibiæ narrow, external spur short, oblique, very near apex.

Black, under surface piceous black; legs, antennæ and p testaceous.

Head small (1·5 × 1·5 mm.), convex, smooth; a shallow alm obsolete fovea in middle of vertex; lateral margins slop obliquely and roundly forward from a little before eyes: clyp not divided from front, lightly emarginate-truncate; median p wide; wings small, not divided from supra-antennal plates, ligh advanced, rounded at apex, sloping very gently on inner side median part; supra-antennal plates small, rather depressed; fa sulci lightly impressed, parallel; facial carinæ wide, not grea raised; eyes large, convex, prominent, lightly enclosed behi Mandibles rather long, decussating, wide at base, narrow a acute at apex. Mentum deeply emarginate; median tooth v wide, short, obtuse. Palpi slender; penultimate joint of maxill nearly as long as terminal, of labial longer, terminal joint fusifo Antennæ filiform, very lightly incrassate; second and third joi of about equal length. Prothorax smooth, broader than lo (2·8 × 2·9 mm.), widest considerably before posterior ang greatly narrowed anteriorly (ant. width 2·2 mm), convex, stron declivous to base; sides rounded; posterior angles lightly mark base of disc curving gently between posterior angles, anter margin truncate; anterior angles widely obtuse, finely border border narrow, fine on basal curve; median and anterior li

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stout, not channelled below, anterior tibiæ narrow, apex long, outturned externa. teeth smal., prominent; posterior tibiæ light, a little incrassate, not arcuate.

Length 11, breadth 4 mm.

Hab. Queensland: Gulf of Carpentaria (a single specimen given to me by Mr. C. French, as from the Burketown District).

CLIVINARCHUS, n.gen.

Head with frontal region a little raised above occipital region, clypeus with median part angulate.

Mandibles short, upper surface depressed; outer margin obtusely angled near basal third.

Mentum deeply emarginate; lobes widely rounded at apex; median tooth long, obtusely pointed, keeled, projecting forward as far as lobes. Submentum large, projecting strongly and vertically from throat; a ridge vertically raised from throat, extending between submentum and base of orbits and defining suborbital channel behind.

Palpi: Labial with penultimate joint short, stout (about as long as terminal), bisetose, terminal joint stout (stouter than penultimate), truncate (hardly narrowed) at apex; maxillary stout, penultimate joint short, conical, terminal joint compressed, oval, obtuse at apex.

Antennæ short, stout, four basal joints cylindrical, first stout not elongate, second not long (but longer than third) joints 5-11 short, compressed, decidedly separated from one another, apical joint obtuse.

Prothorax longer than wide, convex, not declivous to base; a raised declivous "collar" (or wide border) along anterior margin.

Elytra very long, cylindrical, punctate-striate; fourth stria sharply outturned and joining fifth at base; no submarginal carina at shoulder, third interstice 4-punctate.

Prosternum with pectoral part not protuberant, intercoxa part wide anteriorly, non-sulcate on base; episterna over hanging along anterior half, smooth—a few faint trans verse striolæ perceptible with a lens.

Mesosternum smooth, without a lateral impression on each sid of peduncle to receive intermediate tibiæ.

Metasternum large, long, transversely striolate on each side episterna very long and narrow.

Legs: Anterior tibiæ wide, 3-dentate, apical projection shor strong, external teeth short, wide at base, the edge of th tibia triangularly excised above upper tooth so as to for a fourth small non-projecting tooth, inner spines lon intermediate tibiæ with two short prominent triangula external teeth, the anterior at the apex, the upper a litt distance above the apex.

Peduncle wide.

Body winged.

This genus is thoroughly distinct from *Clivina.* Evider differences that may be noted are: its very elongate form, wid peduncle without lateral cavities, the raised and declivous coll along anterior margin of prothorax and the bidentate intermedia tibiæ. The formation of both the upper and lower surfaces of th

irregular rugose; clypeus with median part divided from wings by a carinate ridge, widely and squarely emarginate, its angles porrect projecting strongly forward in a triangular prominence; wings small, angular, anterior margin truncate and about on a level with margin of median part; supra-antennal plates short, not projecting sharply and widely beyond wings of clypeus, external angles widely rounded; eyes large, globose, prominent, lightly enclosed. Prothorax cylindrical, parallel, very widely and lightly sinuate on each side, longer than broad (4 x 3 mm.), lightly convex longitudinally, lightly transversely striolate (the striola wavy and more strongly impressed near sides), anterior angles very obtuse, rounded from anterior marginal puncture to neck; posterior angles rounded, not marked; basal curve short; base wide, border narrow and reflexed on sides, a little upturned at posterior angles, wide on base, very wide and declivous along anterior margin; marginal channel obsolete on sides. Elytra narrow, cylindrical (10·5 x 3·5 mm.), shortly, not vertically, declivous to base; shoulders rounded, not marked; striæ entire, deeply and strongly punctate, the punctures becoming finer from base to apex; interstices hardly convex, three posterior punctures on 3rd interstice on apical half; marginal channel narrow, not deep, lightly punctate. Anterior legs stout; femora thick, compressed, posterior edge of lower side roundly and widely dilatate. Intermediate tibiæ incrassate, external edge arcuate, spinose, bidentate.

Length 18, breadth 3·5 mm.

Hab.—Queensland (sent to me by Mr. C. French as coming from the Gulf of Carpentaria, opposite Wellesley Islands).

Distribution of the Australian Clivinides.

I have thought that a few notes on the geographical distribution of the Clivinides in Australia may be not without interest, though the observations I can offer on the subject must be very defective owing to the scantiness of my knowledge of the range of the various species. The only parts of the continent that have been tolerably well searched for these insects seem to be the

Sydney coastal district; the Melbourne district; the southern pa of South Australia, where the Rev. T. Blackburn has collecte and a part of inland New South Wales lying between Narrande on the Murrumbidgee River, and Mulwala on the Murray, ov which I have collected, though not with sufficient care. Go collections have also been made by Mr. Masters at Port Denis and Gayndah in Queensland, and at King George's Sound; l Mr. Froggatt at King's Sound; and by Mr. Lea at Tamworth New South Wales. No use can be made by me, from want accurate knowledge, of the collections from Melbourne, Sou Australia, Gayndah and King's Sound.

The Clivinides are a well defined division of the subfami Scaritini. They reach their greatest development in the wa parts of the earth, and it is, as might have been expected, tropical Australia that they are most numerous and show t greatest diversity of form. All the Australian genera, v *Dyschirius, Clivina, Steganomma*, and *Clivinarchus* have represe tatives in tropical Queensland, the two last being peculiar to th region.

Dyschirius (5 species) seems spread over the continent.

Clivina (83 species) has representatives wherever there water of any permanence all over Australia. The following a a few remarks on the dispersion of the thirteen groups into whi

when they hibernate, hidden in the earth, often away from t immediate proximity of water. During floods they may be tak plentifully in the débris drifted along by the swollen stream Owing to their habits it is evident that their dispersion may aided by streams, and there seem no reasons, except those climate and food-supply, why a species having once gained footing on any watershed should not spread along all the strea of such watershed.

With the insufficient data at my command no conclusions inferences of any practical worth in regard to the distribution the Australian species of *Clivina* can be attempted; but t following suggestions may be offered:—(1) The sameness climate will have permitted a wide range for species from east west. (2) The number of different species may be expected to greater on the coastal side of the mountain ranges owing to t greater number of separate river systems. (3) The large ar included in the watershed of each of the two great river syste which collect the waters flowing from the inland slopes of t dividing ranges of Eastern Australia, from the boundary betwe The Northern Territory of South Australia and Queensland Western Victoria, viz., the Barcoo watershed and the Murr watershed, will have been conducive to a wide range for t species found in the areas of these river systems. There certain

The following lists of species give those known to me as coming from (1) Tropical Queensland, (2) the Sydney district, (3) the part of New South Wales between the Murray and Murrumbidgee Rivers along the 146th parallel of longitude (Riverina), (4) South West Australia.

Tropical Queensland.	Sydney.	Riverina.	South-west Australia.
C. biplagiata	*C. biplagiata*	*C. obliterata*	*C. cribrosa*
C. frenchi	*C. angustula*	*C. biplagiata*	*C. coronata*
C. cylindriformis	*C. sellata*	*C. melanopyga*	*C. dorsalis*
C. obsoleta	*C. australasiæ*	*C. riverinæ*	*C. bicolor*
C. quadratifrons.	*C. vittata*	*C. planiceps*	*C. olliffi*
C. carpentaria	*C. lepida*	*C. quadratifrons*	*C. angustipes*
C. grandiceps	*C. dilutipes*	*C. tumidipes*	
C. punctaticeps	*C. sydneyensis*	(*C. angustula**).	
C. lobipes	*C. basalis*	*C. sellata*	
C. flava	*C. oblonga*	*C. australasiæ*	
C. odontomera		*C. vagans*	
C. bovillæ		*C. simulans*	
C. cava		*C. basalis*	
C. occulta		*C. felix*	
C. ferruginea		*C. procera*	
C. felix			
C. rubripes			
C. procera			
C. monilicornis			
C. nyctosyloides			
C. interstitialis			
C. ovipennis			
C. marginata			
C. tenuipes			

The following is a list of the authors who have dealt with the nomenclature of the Australian Clivinides, with references to their papers :—

CHAUDOIR. Carabiques Nouveaux. Bull. Mosc. 1843, xvi. p. 733.

BOHEMANN. Eugenies Resa, Coleoptera, 1858.

* I have not found *C. angustula* further east than Carrathool, on the Murrumbidgee River, 32 miles east from Hay.

PUTZEYS, JULES. Postscriptum ad Clivinidarum Monographia atque de quibusdam aliis. (Mense Nove bris 1861.)* Mém. Soc. Roy. Sc. Liège, 186 xviii. pp. 1-78.

——— Révision des Clivinides de l'Australie. Ste Ent. Zeit. 1866, xxvii. pp. 33-43.

——— Révision Générale des Clivinides. Ann. S Ent. Belg. 1867, x. pp. 1-242.

——— Supplément à la Révision Générale des C vinides. l.c. 1868, xi. pp. 5-22.

——— Deuxième Supplément à la Révision Génér des Clivinides. l.c. 1873, xvi. pp. 1-9.

MACLEAY, WILLIAM. On the *Scaritidæ* of New Holland. Tra Ent. Soc. N.S.W. 1863, i. Part 1, pp. 71-

BLACKBURN, THOS. Notes on Australian Coleoptera, with Descr tions of New Species, Part iv. Pr Linn. Soc. N.S.W. (2). iv. 1889, 717-722.

——— Coleoptera (of Elder Exploring Expeditio Trans. Roy. Soc. S.A. (1892), xvi. p. 2

Notes on Australian Coleoptera, with Descr

a splendid collection of 120 specimens, representing 40 different species, of which 7 were new, and for the gift of many rare specimens; to the Rev. T. Blackburn, of Adelaide, for loan of specimens of new and rare species, and for the gift of specimens of various species; to Mr. A. M. Lea, of the Bureau of Agriculture, West Australia, for generously placing his whole collection of species taken by him in New South Wales at my disposal, and for specimens from West Australia; and to Mr. W. Kershaw, of Melbourne, for some Victorian specimens.

ON THE BAG-SHELTERS OF LEPIDOPTEROU LARVÆ OF THE GENUS *TEARA*.

By Walter W. Froggatt.

(Plate xiv.)

In many parts of the Australian bush one frequently cor across brown liver-coloured silken bags of an irregular fun shape, spun round a stout twig enclosing several others, a frequently a few leaves, all matted together and rough on t inner surface, but smooth and regular on the outside. They va in size from 3-8 inches in diameter at the broad end, whi may be quite open or loosely covered with a few silken strand upon examination, if freshly constructed, they will be found fu of very hairy caterpillars mixed up with their castings an moulted skins.

When they have served their purpose, and are abandoned b the full grown caterpillars, they will remain for a considerabl time, a solid mass of skins and castings, compact and firm, pro tected by the strong silken coverings. These curious structure are woven round the twigs by the gregarious larvæ of severa different species of moths belonging to the genus *Teara* (Famil

low and sluggish in its habits, and is usually found clinging to ɔw bushes.

I have, during the last season, been fortunate in breeding out ıe of our largest species, which spins a somewhat different form shelter, which is described below with the life-history of the ecies.

TEARA CONTRARIA, Walker.

The larva, when full grown, is two inches in length, of a form thickness, with the head ferruginous, rounded on summit sides, a pale median suture running into the triangular eus; labium and jaws small; all the head thickly covered with reddish-brown hairs standing out in front. Thoracic and minal segments black across the centre, which is raised into w of large tubercles, out of which spring a number of long white and reddish-brown hairs; between the segments thickly red with small white spots, from each of which springs a t black hair. Under side pale ochreous yellow, with a double of dark ferruginous tubercles tufted with reddish-brown s; legs ferruginous, black at the tips, covered with short lish hairs; tubercles on the 1st and 2nd abdominal segments, claspers upon the following segments covered with stout lish-brown hairs.

he larvæ live in communities of a hundred or more, forming a d silken bag or net of a dark reddish-brown colour on the tered side of the tree trunk, close to the ground, under which hide during the day, half buried in the cast skins and excreta ch accumulate beneath. They crawl up the tree at dusk, ling upon the foliage, and returning to their retreat at day-t. In April last a clump of very fine wattles (*Acacia pro-ens*) were completely defoliated by them near the Penshurst way station. Every other tree had a large bag at the foot of trunk, while branches and trunk were festooned with strands dirty yellow silk down to the top of the bag.

About fifty specimens of nearly mature larvæ were collected placed in a large glass jar in the Museum, where they

remained huddled together in a hairy mass, unless d
when they would all set off in a procession round the
their prison, one behind the other, often keeping it up f
together. In about a fortnight they began to burrow
loose sand at the bottom of the jar, constructing so
cocoons out of the hairs upon their bodies. The pupæ w
and short, smooth, shining, of a reddish brown colour,
anterior portion small and the tip of the abdomen
upwards. The first moths emerged about the end of Se
and the last two months later; but from the fifty speci
more than eight moths were obtained.

The moths vary considerably in size; the male about
across the wings, and the female often over 2½ inches; th
a general dark brown colour, with a small oval white sp
centre of the forewings; and a very small and indistinc
the hind ones. The head and thorax are thickly clot
long brown hairs, bright yellow and lance-shaped at the
upper surface of the abdomen is covered with bright
orange barred with black at the apex of each segment, ar
with hairs of the same colour. The moths are very di
breed, those mentioned being the first I have obtained
seasons. Mr. E Anderson, of Melbourne, to whom I
debted for the identification of the moth, tells me that I

NOTE ON THE OCCURRENCE OF DIATOMACEOUS EARTH AT THE WARRUMBUNGLE MOUNTAINS, NEW SOUTH WALES.

By T. W. Edgeworth David.

(Plates xv.-xvii.)

I.—*Introduction.*

Deposits of diatomaceous earth have been recorded as occurring in New South Wales at the following localities:—Barraba (between Tamworth and Bingara); the Lismore District; the Richmond River; the Tweed River; Cooma; Newbridge; and the Warrumbungle Mountains. The deposit near Barraba has been described by Mr. E. F. Pittman, the Government Geologist, in general terms.*

Mr. Pittman states that the diatomaceous earth is capped by basalt, and attains a thickness of about 8 feet, having a layer of coarse sand (2 inches thick) about 3 feet from the top. The infusorial earth rests on a bed of sandy mudstone, about 1 foot in thickness, under which is an impure infusorial deposit containing rolled pebbles and fragments of imbedded lava, pointing to the fact that volcanic eruptions were common at the time of its deposition. Finally, an overwhelming flow of lava filled up what was, doubtless, during the Miocene epoch, a lake, and it now forms an elevated tableland. As far as I am aware, this is the only reference to the mode of occurrence of diatomaceous earth in New South Wales. Descriptions have been given by other observers of hand specimens of the diatomaceous earth.

* Ann. Rept. Dep. Mines, 1881, pp. 142-143. By Authority. Sydney, 1882.

In 1888 Professor Liversidge published an account of *T*
*Infusorial Earth,** from Barraba.

He states that the "tripoli" at Barraba is made u
entirely of the remains of Diatoms resembling *Melosir*
same author refers to a deposit (*op. cit.* p. 194) of "c
from the Richmond River. There can now be little do
this material, described as "a very white and porous
silicate of alumina,† often sent down to Sydney as meers
must graduate into a clayey diatomaceous earth, as Di
some numbers have been observed by me in a similar ro
the same locality. Professor Liversidge gives analyse
rocks from both the above localities.

Mr. R. Etheridge, Junr., has published a short descri
some hand specimens of the diatomaceous earth fr
Warrumbungle Mountains, and also of similar specimen
tively from the Lismore District, Tweed River, and R
River Districts.‡

He refers the barrel-shaped Diatoms, so conspicuous
deposits, to *Melosira*, and notes the association with
spicules of freshwater sponges.

Last September Judge Docker and the author were aff
opportunity, through the kindness of Mr. W L. R. G
[illegible] Station of examining the deposit of diat

large volcanoes; and their cores of coarsely crystalline trachyte, ch have cooled deep down in the volcanic chimneys, now r themselves skywards as gigantic monoliths, between 3,000 and 0 feet above the sea, and over 2,000 feet above the surrounding n, ringed round with alternating beds of coarse trachyte tuff lava.

e chain extended probably from at least as far south as the bolas, near Orange, northwards, perhaps, with intervals, to the -House Mountains on the coast north of Brisbane, a distance arly 400 miles. As the diatomaceous earth deposits are stratified with the trachytes it is obvious that any evidence throws light upon the age of the trachytes has an equally tant bearing upon the question as to the age of the diatoous earths.

shown on Plate xv., accompanying this paper, there is evidence to show that the trachytes have intruded the -Carboniferous Coal-measures in this neighbourhood The consist of sandstones, quartzites, cherts containing well ved specimens of *Glossopteris*, finely laminated black shales, t least one seam of coal, over 6 feet in thickness. The coal een calcined by the trachyte dykes, and at the extreme of the section, beds of trachyte tuff are seen resting, with unconformity, on the Permo-Carboniferous strata. usly then the eruption of the trachytes was later than Permoniferous time.

several localities in the Warrumbungle Mountains the

abundantly interstratified with rocks of the Desert Sandstone Series, the age of which is Upper Cretaceous.*

It is unlikely that these extensive eruptions took place in Lower Cretaceous time, as that was a period of prolonged subsidence, and Mr. R. L. Jack has commented on the fact that in Queensland, at any rate, no lavas nor tuffs have as yet been noted in the Rolling Downs Series (Lower Cretaceous). As regards the downward limit in time of these eruptions, it is improbable, therefore, that it was earlier than Upper Cretaceous.

As regards the upward limit, the following considerations suggest themselves:—It is improbable that the Warrumbungle trachyte volcanoes, at the time they were active, were far distant from the sea. They are now over 300 miles inland from the Pacific, but during the Lower Cretaceous epoch the waters of the inland sea, which, at that time, must have extended from the Gulf of Carpentaria to the Australian Bight, must very nearly have washed the bases of the Warrumbungles. In Upper Cretaceous time elevation took place, and marine conditions were largely replaced in Central Australia by shallow lacustrine conditions. There is no evidence to show that marine conditions obtained within a hundred miles of the Warrumbungles in Tertiary time. On physical evidence therefore it might be inferred that the age of the trachyte series might be placed at the close of the Cretaceous, or at the commencement of the Eocene periods. There is also some palæontological evidence in support of this supposition, as will be stated in the next division of this paper.

rock has already been ably described by Mr. G. W. Card,* Mineralogist to the Geological Survey of the Department of s.

nderlying this is another also very remarkable bed of yte tuff, almost exclusively composed of translucent crystals idine, from a fraction of an inch up to ½ an inch in diameter. ystals exhibit their usual tabular habit, the clinopinacoid faces extensively developed. The bed being only loosely coherent, in washes quantities of the larger sanidines out of it, and with them miniature snow-white talus slopes.

t follows the bed of diatomaceous earth, 3 feet 9 inches thick; some 19 feet 3 inches of strata, chiefly trachyte tuffs, g on the surface of a sheet of vesicular trachyte. Half-a-higher up the creek, the lower section shown on Plate xvi. e studied. It resembles the section above quoted, but in on fossil leaves occur on a horizon immediately above and tely associated with the diatomaceous earth, as was shown Mr. W. L. R. Gipps. We had here the good fortune to dis- fossil leaf fairly well preserved in the fine tuff, which Mr. R. dge, jun., and Mr. W. S. Dun, Assistant Palæontologist to eological Survey, identify as *Cinnamomum Leichhardtii*, shausen. (See Plate accompanying this paper). This leaf where in Australia associated with Eocene deposits.

age therefore of the Diatoms and of the freshwater sponge s associated with them at this spot may, I think, be pro- lly set down as early Eocene or late Cretaceous.

in this deposit, as I understand that this is a work which h already been commenced by Mr. W. S. Dun and Mr. G. W. Ca and an interesting paper from them on this subject may shor be expected. I would merely add that *Melosira* appears greatly predominate among the Diatoms, but not to the ent exclusion of other forms. The sponge spicules are acerate fusiform, slightly arcuate, and some are thorny, but the majori smooth

I should like to emphasise the fact that hitherto all our diat maceous earths in New South Wales have been found in associ tion with volcanic rocks, and I would venture to suggest that th association is probably far from accidental The superheat water flowing from hot springs and from the lavas themselv during the trachytic eruptions would be certain to carry more less silica in solution, and its high temperature, combined wi its dissolved silica, would probably render it a very favourab medium for the development of Diatoms to the exclusion of mo other kinds of plant. While some species of Diatoms flouri luxuriantly in the cold waters of the Antarctic Ocean, others m be found equally flourishing in the hot and highly mineralis waters of geysers. For example, Mr. H. N. Moseley* has describ the occurrence of Diatoms near the Boiling Springs at Furnas, S Michael's, Azores, and their neighbourhood.

ocula and other Diatoms, such as those met with amongst the n matter growing in very hot water." He also observes (*op.*). 323), "In this water, which was too hot to bear the finger, ame *Chroococcus* as observed at the springs near the lake was dant," etc. . . . "A little lower down in a small pool of ud and water, so hot that the finger could only be borne in a short time, grows a sedge . . . and an abundant h of algæ, *Chroococcus*, *Oscillatoriæ* [*Tolyphothrix* f. Archer. E.D] and some Diatoms with endochrome complete"

temperature of the springs in the lake of Furnas is quoted t. p. 324), f. Hartung* as from 78° to 190° Fahr. The in which the *Chroococcus* grew is estimated to have had a ature of 149° to 158° Fahr, and that in which the sedges f 113° to 122° Fahr. Mr. W. T. Thiselton Dyer, in notes . Moseley's collections (*op. cit.* p. 326), states that in the ion submitted to him "from among the sedges at Furnas in ot water" he identified a number of Diatoms, which he cally names. He adds that they were not numerously ented, however, and says (p. 327), "These are all forms of on occurrence, and seemed in no way affected by the high rature of the water." A useful bibliography of references e vegetation of hot waters is contained in Ninth Report, Sur. U.S.A. 1887-88, pp. 620-628. It is noted (*op. cit.* 5, quoted from Manual of Geology, by James D. Dana, d., 1880, p. 611) that "Mr. James Blake found diatoms in having a temperature of 163° F at Pueblo Hot Springs,

being recognized by D. Billings." . . . (*Op. cit.* p
"The extreme temperature at which vegetation has been ob
is 200° F, recorded by Prof. W. H. Brewer at the Cali
Geysers."

It is clear therefore that Diatoms are capable of flourish
the waters of hot springs, the water of which must necessa
more or less highly mineralised, though apparently they d
flourish in water at so high a temperature as that in which
algæ, such as the *Oscillatoriæ*, can flourish. The fact mu
be forgotten that spicules of *Spongilla* are at the Warrumb
Mountains associated with the Diatoms, and obviously
Diatoms flourished in hot water the Sponges must have e
under similar conditions.

Animal life was well represented in the neighbourho
Furnas by Rhizopods, but no mention is made of fresh
sponges.

It is at all events certain that at the Warrumbungle Mou
the Diatom *Melosira* and a variety of *Spongilla* occur in a
tion with trachytic lavas and tuffs of early Tertiary, poss
late Cretaceous Age.

EXPLANATION OF PLATES.

On behalf of Mr. F. M. Bailey, Government Botanist of Queensland, the Secretary exhibited an interesting collection of botanical specimens specially brought together to illustrate the plants of Queensland which are known to possess active or medicinal properties. As such it might be considered to illustrate a later edition of the knowledge summarised in a paper by the exhibitor "On the Medicinal Plants of Queensland" in the Society's Proceedings for 1880 (Vol. v. First Series, p. 4).

On behalf of Dr. Broom, the Secretary exhibited specimens illustrative of the fossil Marsupials from a bone-breccia deposit near the Wombeyan Caves, described at the Meeting of April 29th, 1896.

Mrs. Kenyon sent for exhibition, and contributed a note upon, specimens of varietal forms of *Cypræa.*

Mr. Darley exhibited a specimen of rock from Newcastle bored by specimens of *Pholas*, with examples of the molluscs *in situ.* Also from the roof of a building in Sydney a piece of sheet-lead which had been perforated by Termites.

Mr. Steel showed an elegant fungus, probably *Polyporus portentosus*, Berk., from Bundanoon.

Mr. Froggatt exhibited drawings and specimens of the larva, pupa, moth, and bag-shelters of *Teara contraria* from Penshurst, near Sydney; in this locality during April many trees of *Acacia prominens* were completely defoliated by the caterpillars, the shelters being placed at the foot of the trees. Also the more substantial silken shelter of a species from Kalgoorlie, W.A.; and a series of specimens of the commoner species of the genus occurring in New South Wales.

The President exhibited a rare and remarkable spider, *Actinopus* sp., forwarded by Mr. A. G. Little, Railway Surveyor, Menindie, N.S.W. This is apparently the first recorded occurrence of the genus in Australia. In respect of the length of the palpi and the shortness of the abdomen it appears to come nearest to *A. longipalpus* from Brazil.

WEDNESDAY, JULY 29th, 1896.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, July 29th, 1896.

The President, Mr. Henry Deane, M.A., F.L.S., in the Chair.

Mr. J. Douglas Ogilby, Livingstone Road, Petersham, was elected a Member of the Society.

DONATIONS

La Faculté des Sciences de Marseille—Annales. Tome v. Fasc. 4; Tome vi. Fasc. 1-3. *From the Faculty.*

Cambridge Philosophical Society—Proceedings. Vol. ix. Part ii. (1896). *From the Society.*

Royal Microscopical Society—Journal, 1896. Part 2 (April). *From the Society.*

Société Belge de Microscopie—Bulletin. Tome xxii. Nos. 5-7 (1895-96). *From the Society.*

Geological Society, London — Quarterly Journal. Vol lii. Part 2 [No. 206] (May, 1896). *From the Society.*

Zoologischer Anzeiger. xix. Bd. Nos. 503-505 (May-June, 1896). *From the Editor.*

K. K. Zoologisch-botanische Gesellschaft in Wien—Verhandlungen. xlvi. Bd. (1896), 4 u. 5 Hefte. *From the Society.*

Verein für naturwissenschaftliche Unterhaltung zu Hamburg —Verhandlungen, 1894-95. ix. Band. *From the Society.*

Department of Mines and Agriculture, Sydney — Annual Report for the year 1895: Agricultural Gazette. Vol. vii. Part 6 (June, 1896). *From the Hon. the Minister for Mines and Agriculture.*

Australasian Association for the Advancement of Science — Report of the Sixth Meeting held at Brisbane, January, 1895. *From the Association.*

Pharmaceutical Journal of Australasia Vol. ix. Nos. 6-7 (June-July, 1896). *From the Editor.*

Department of Agriculture, Brisbane—Bulletin. No. 8, Second Series (1896). *From the Secretary for Agriculture.*

Bureau of Agriculture, Perth, W.A.—Journal. Vol. iii. Nos. 15-17 (June, 1896). *From the Secretary.*

University of Melbourne—Examination Papers—Matriculation. May, 1896. *From the University.*

Asiatic Society of Bengal—Journal. Vol. lxiv. (1895), Part No. 4; Part ii., Title page and Index: Vol. lxv. (1896), Part No. 1: Proceedings 1895, Nos. ix.-x. (Nov.-Dec.); 1896, No (Jan.): Annual Address. By A. Pedler, F.R.S. etc. (Feb., 189 *From the Society.*

Zoological Society of London—Abstract, May 19th, June 2 and 16th, 1896. *From the Society.*

Madras Government Museum—Bulletin. No. 4 (1896). *From the Superintendent.*

Museo Nacional de Montevideo—Anales iv. (1896). *From the Museum.*

Perak Government Gazette. Vol. ix. Nos. 13-14 (June, 1896). *From the Government Secretary.*

Société Royale Linnéenne de Bruxelles—Bulletin. 21me Année, No. 7 (May, 1896). *From the Society.*

Sociéte Hollandaise des Sciences à Harlem—Archives Néerlandaises. Tome xxx. 1re Livraison (1896). *From the Society.*

Victorian Naturalist. Vol. xiii. No. 3 (June, 1896). *From the Field Naturalists' Club of Victoria.*

... From the Society.

Royal Society of South Australia – Transactions. Vol. xvi. rt iii. (June, 1896). *From the Society.*

'oological and Acclimatisation Society of Victoria—Thirty-nd Annual Report (Feb., 1896). *From the Society.*

hree Pamphlets entitled "Report of the Research Committee inted to collect Evidence as to Glacial Action in Australasia." Professor R. Tate, Mr. W. Howchin, and Professor T. W. E. d (1895): "Address by the President: Section of Geology and ralogy"—Aust. Assoc. for Adv. Sci. By Professor David bane, 1896); "Antarctic Rocks," &c. (1895). *From Professor '. E. David B.A., F.G.S.*

istralasian Journal of Pharmacy. Vol. xi. No. 127 (July,). *From the Editor.*

nerican Naturalist. Vol. xxx. No. 354 (June, 1896). *From 'ditors.*

useum of Comparative Zoology at Harvard College, Cam-ge, Mass.—Bulletin. Vol. xxix. No. 3 (April, 1896). *From 'urator.*

S. Dept. of Agriculture—Division of Entomology—Bulletin. nical Series No. 4 (1896). *From the Secretary of Agriculture.*

Two Pamphlets entitled "Further Coccid Notes, etc.;" and "Contributions towards a Monograph of the *Aleurodidæ*, a Family of Hemiptera-Homoptera." By W. M. Maskell. (From Trans. N.Z. Inst. Vol. xxviii. [1895]). *From the Author.*

Indian Museum, Calcutta—Natural History Notes. Series ii. No. 18 [? 19] (1895). *From the Museum.*

Geelong Naturalist. Vol. v. No. 4 (July, 1896). *From the Geelong Field Naturalists' Club.*

L'Académie Royale des Sciences, etc. de Danemark, Copenhague—Bulletin, 1896. No. 3. *From the Academy.*

APPENDIX TO THE AUSTRALIAN CLIVINIDES (FAM. *CARABIDÆ*).

By Thomas G. Sloane.

The Clivinides of King's Sound and its Vicinity.

When the late Sir William Macleay described the *Carabidæ* collected by Mr. W. W. Froggatt in the vicinity of King's Sound in 1887,* he passed over the *Clivinides*, merely remarking that the collection contained seventeen species.† During a visit to Sydney, after completing the "Revision of the Australian *Clivinides*," I was able, through the courtesy of Mr. Masters, Curator of the Macleay Museum, to examine the *Clivinides* from King's Sound, and as the collection seems a representative one the following report on it will not be without interest.

The following is a list of the species :—

Clivina riverinæ, Sl. ? (var. ?)
C. denticollis, Sl.
C. quadratifrons, Sl.
C. punctaticeps, Putz.
 var. *sulcicollis*, Sl.
C. australica, Sl.
C. bovillæ, Blkb.
C. cava, Putz.
Clivina sellata, Putz.
 var. *inconspicua*, Sl.
C. ferruginea, Putz.
C. australasiæ, Bohem. ? (var. ?)
C. eximia, Sl.
C. leai, Sl.
 var. *apicalis*, Sl.
C. procera, Putz. (var.)‡
C. froggatti, n.sp.
Dyschirius macleayi, n.sp.

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* P.L.S.N.S.W. 1888, iii. (2) pp. 446-458.

† *l.c.* p. 462.

‡ It is the large species mentioned under *C. procera* (*vide supra*, p. 229) as being from Port Darwin; and though probably distinct from *C. procera*, Putz., seems to offer no characters to distinguish it from that species except its large size.

My examination of this collection leaves the impression on my mind that all the specimens are not actually from King's Sound, but that some, as *C. procera* and *C. quadratifrons*, may be from Port Darwin or some other more easterly port of call, at which Mr. Froggatt may have touched.

Clivina riverinæ, Sloane.*

The single representative of this species seems to agree with typical specimens in everything excepting colour. It is brown with the elytra ferruginous.

Clivina punctaticeps, Putzeys (var. sulcicollis).

A species which is plentifully represented in the collection agrees with *C. punctaticeps*, Putz., in respect of the head, elytra, prosternum, and eyes, but differs by having the prothorax shorter and rather more convex, the median line more deeply impressed, the basal curve shorter, the base more deeply and abruptly declivous, the marginal channel across the base much wider and deeper. It may be a distinct species, though it seems probable that *C. punctaticeps* will be found to be a widely spread species varying sufficiently to take in this form as a variety. The following is a brief description :—

Narrow, parallel, convex. Piceous red, elytra with first stria

CLIVINA SELLATA, Putzeys (var. ? INCONSPICUA).

A small *Clivina* represented by seven specimens (two immature) is among those from King's Sound. It agrees so closely with *C. sellata*, Putz., that I have placed it under that species as a variety; the only differences I can find are that it seems a smaller insect, and apparently the black dorsal spot on the elytra is quite wanting; however, I cannot separate immature specimens from immature specimens of *C. sellata*. It is quite likely that when this form is better known it will come to be regarded as a species distinct from *C. sellata*, and it is with this impression in my mind that I give it a varietal name, for I feel that it would be misleading to extend the range of *C. sellata* to King's Sound on the specimens before me.

The following description will suffice for its recognition :—

Ferruginous. Parallel, convex. Head short, vertex with a rounded punctate impression: clypeus emarginate, median part not divided from wings, these small, rounded, a strong sinuosity dividing them from supra-antennal plates. Prothorax about as long as broad (1·1 × 1·1 mm.), decidedly narrowed anteriorly. Elytra punctate-striate, fourth stria joining fifth at base, seventh entire. Prosternum with intercoxal part attenuate anteriorly. Anterior tibiæ 4-dentate.

Length 3·7-4·2, breadth 1-1·15 mm.

CLIVINA AUSTRALASIÆ, Bohemann ? (var. ?).

A large black species is plentifully represented in the King's Sound collection. In general appearance it exactly resembles *C. australasiæ*, Bohem., the only noticeable differences that I can see being, the head less punctate and more roundly angustate before the eyes, the legs lighter coloured, the inner apical spine of the anterior tibiæ longer and more obtuse at the apex in the ♂. Some specimens have the clypeus more deeply emarginate than others.

Length 8-9·5, breadth 2·4-2·7 mm.

CLIVINA FROGGATTI, n.sp.

Robust, convex. Head short, wide, clypeus truncate-emarg nate; prothorax subquadrate, with all its angles rounded; elyt oval, seventh and eighth interstices uniting at base to for a short, not strong, marginal carina, eighth interstice indicated l a fine carina near apex; prosternum with intercoxal part wi anteriorly, non-sulcate on base; episterna very finely shagreen finely transversely striolate; metasternum, between intermedia and posterior coxæ, about as long as posterior coxæ; episterna so elongate; anterior tibiæ 3-dentate. Black, shining, legs a antennæ reddish piceous.

Head transverse, convex; anterior part rugulose; vertex wid clypeal elevation arcuate; clypeus irregularly divided from fro deeply and widely truncate-emarginate, wings advanced, sma obtusely rounded, concave, gently oblique on inner side; supr antennal plates convex, rounded externally, bordered, divid from wings of clypeus by a light sinuosity; facial sulci deep a divergent posteriorly; frontal impressions strongly marke irregular; facial carinæ short, wide, prominent; supra-orbit punctures distant from eyes, set in a longitudinal groove, low edge of this groove carinate; eyes globose, prominent, light enclosed behind; orbits abruptly constricted behind eye

Four specimens; the one measuring 7·2 mm. in length is, judging from the other three, an unusually small specimen.

Closely allied to *C. macleayi*, Sl., but differing in having the eyes more prominent and spherical, the facial sulci shorter, less arcuate and less convergent in front, the frontal foveæ deeper; the prothorax more convex, the sides not sinuate and much more strongly rounded to anterior angles, the anterior margin less emarginate, the anterior angles obtusely rounded and less marked; the elytra with distinctly crenulate striæ, the eighth interstice indicated near apex; the metasternum longer and with a deeply impressed channel near external margin, the metasternal episterna a little longer and with a strongly marked channel near inner margin; the colour deep black.

DYSCHIRIUS MACLEAYI, n.sp.

Robust, convex. Head strongly depressed between eyes, front carinate in middle, clypeus deeply and roundly emarginate with prominent lateral angles; elytra convex, basal part—in front of testaceous fascia—strongly punctate-striate (eight rows of punctures); anterior tibiæ 3-dentate. Head piceous black; prothorax shining bronzy-black; elytra ferruginous with a bronzy tinge, a wide testaceous fascia across apical third; legs, antennæ and under surface of prothorax reddish, body reddish piceous.

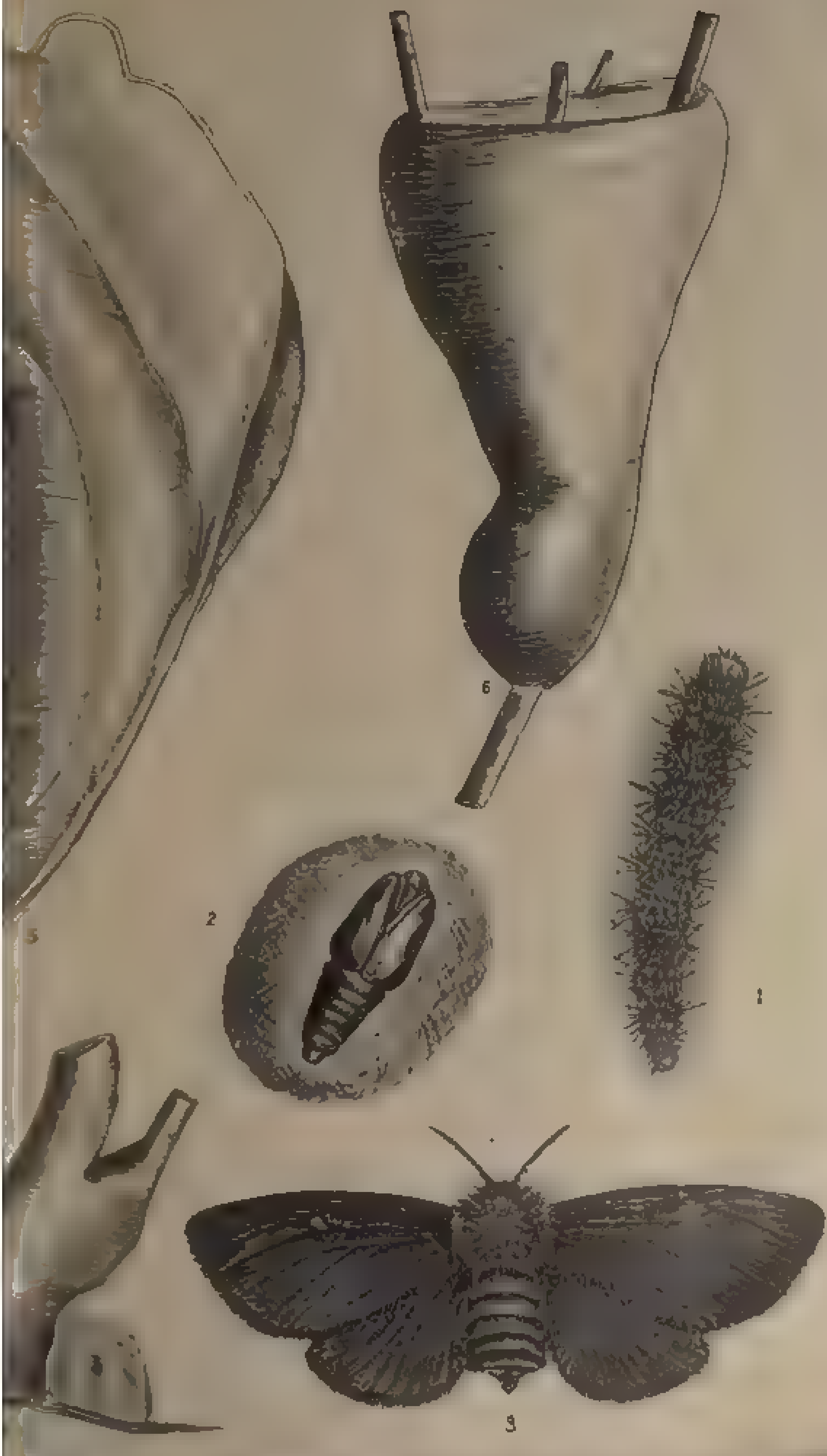
Clypeus declivous, anterior margin roundly emarginate, lateral angles advanced, obtuse at apex; supra-antennal plates large, quadrate, bordered, projecting widely and sharply beyond clypeus, declivous on inner side, anterior angles obtuse, anterior margins oblique; front depressed, a longitudinal carina in centre, two transverse impressions on each side between central carina and supra-antennal plates; vertex convex, smooth; supra-orbital carinæ well developed, thick; eyes globose, prominent. Prothorax globose, lævigate, a light transverse impression near anterior margin; median line wanting; marginal channel of base punctate. Elytra rounded on sides; shoulders rounded; striæ consisting of rows of deep coarse punctures, first stria only reaching apex, a short deep stria near margin on each side of apex; interstices

convex on basal part of disc, third, fifth and seventh bearing some setigerous punctures; apical part of elytra smooth excepting for these punctures; marginal channel narrow on sides, stronger and more deeply impressed behind shoulders. Anterior tibiæ with apical digitation long, arcuate; two upper teeth successively shorter, well developed, prominent, acute.

Length 4, breadth 1·15 mm.

Evidently allied to *D. torrensis*, Blkb., but differing in colour, and apparently in the sculpture of the head.

Note.—It seems worthy of notice that there are eight striæ on each elytron of this species; the eighth stria consists of three or four punctures, and rises where the marginal channel narrows behind the shoulders. *D. zonatus*, Putz., a specimen of which I have seen in the Macleay Museum, has only seven striæ on each elytron (the normal number among the *Clivinides*), and has the marginal channel wider and more punctate.



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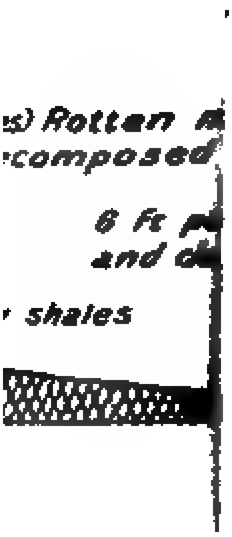
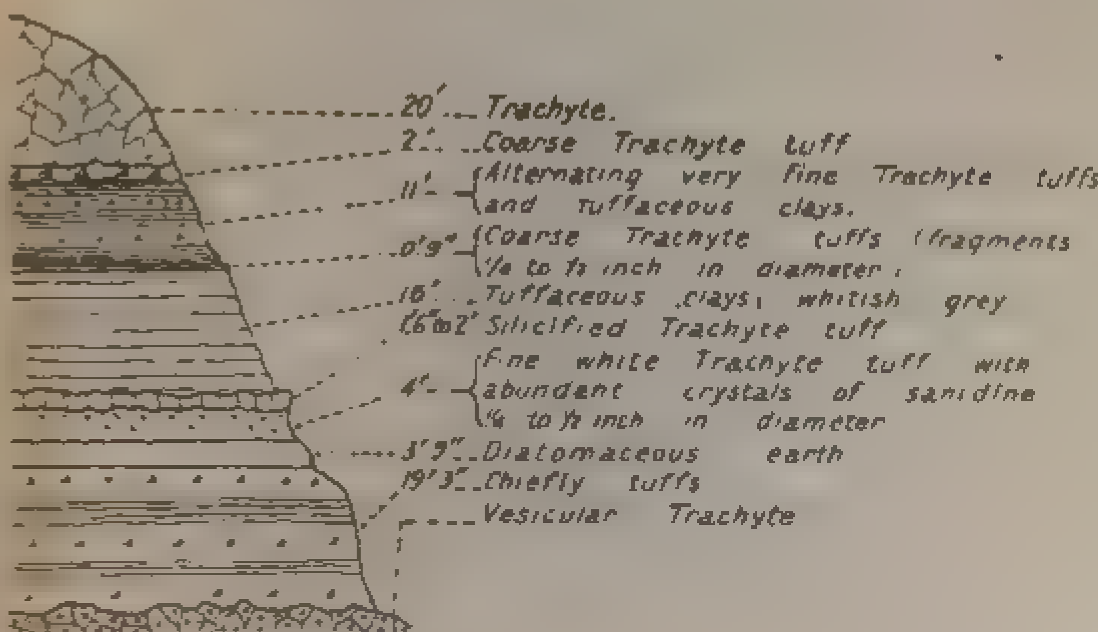
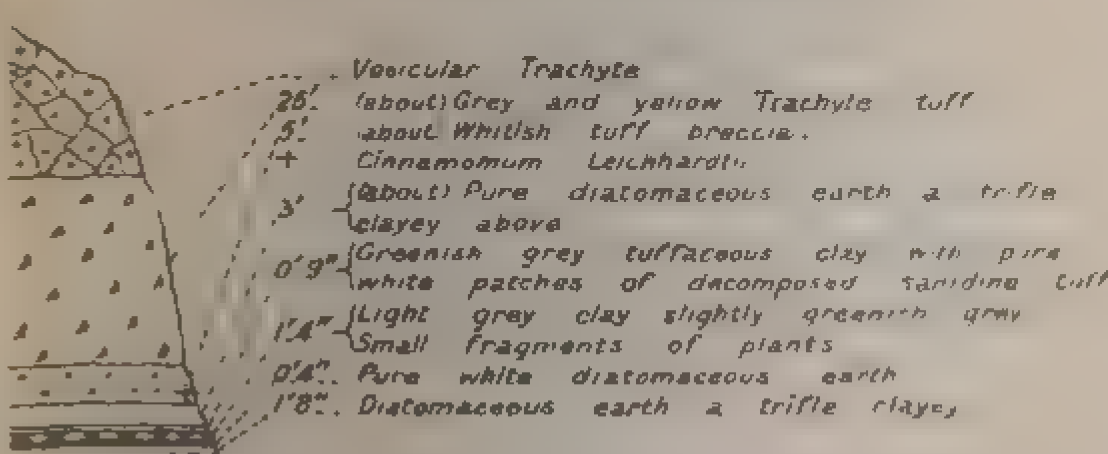


SECTION *in Wantialable Creek Near Tooraweena, Warrumbungle Mountains, showing intercalation of Diatomaceous Earth in the Trachyte Series*



SECTION *in Wantialable Creek, Near Tooraweena, Warrumbungle Mountains showing diatomaceous earth in association with Cinnamomum Leichhardtii*



Vertical Scale 0 10 20 30 40 50 60 feet

DESCRIPTION OF A NEW SPECIES OF *ABLEPHARUS* FROM VICTORIA, WITH CRITICAL NOTES ON TWO OTHER AUSTRALIAN LIZARDS.

By A. H. S. Lucas, M.A., B.Sc., and C. Frost, F.L.S.

Ablepharus rhodonoides, sp.nov.

Snout broad, obtuse; rostral projecting. Eye incompletely surrounded with granules. Nasals large, forming a short suture behind the rostral; frontonasal much broader than long, forming a broad straight suture with the frontal; prefrontals widely separated, as long as the fronto-prefrontal suture; frontal large, longer than the frontoparietals and interparietal together, nearly as long as its distance from the nuchals, in contact with the the anterior supraoculars; three supraoculars, second largest; five supraciliaries; frontoparietals united; interparietal distinct; parietals about twice as broad as long, forming a suture behind the interparietal; three or four pairs of nuchals; five upper labials, fourth below the eye; five lower labials. Ear-opening minute, distinct. Body much elongate, scales in over sixty transverse series between axilla and groin, arranged in twenty longitudinal series; dorsals largest, laterals smallest. Two enlarged præanals. Limbs short, tridactyle, widely separated when adpressed; the fore limb shorter than the distance from the end of the snout to the ear-opening; hind limb a little shorter than the distance from the end of the snout to the shoulders; length of outer toe twice the length of the middle, four times that of the inner toe. Tail almost as long as head and body.

Colour.—Greyish above; each of the dorsal scales with a black central streak, forming four longitudinal series; a black lateral band from the nostril through the eye. Tail brownish. Under-surfaces yellowish.

Dimensions :—

Total length	...	79 mm.
Head ..	...	5 ,,
Width of head...		3·5 ,,
Body ...	...	39 ,,
Fore limb	...	4·5 ,,
Hind limb	...	9·5 ,,
Tail (reproduced)		35 ,,

Locality.—Mildura, Victoria. Two specimens obtained favour of Rev. Walter Fielder.

Remarks.—This species is allied to *A. greyi*, Gray, by the h scaling, but in habit resembles *A. lineatus*, Bell, and *A. muel* Fischer. It differs from *A. lineatus* in head-scaling, in numbe digits, and in the number of longitudinal series of body sc and from *A. muelleri* in the head-scaling. The genus *Ablephi* is characterised by its snake-like absence of movable eyel and the three species, *A. muelleri*, *A. lineatus*, and *A. rhodono* show a further approach to the snake type in the reductio size of the limbs and in the number of the digits.

It is convenient here to add remarks on two other lizards.

(1) *Ablepharus greyi*, Gray.

Museum, we have come to the conclusion that our specimens described from the St. Clair Lake, Tasmania, in the P.L.S.N.S.W. 1893, p. 227, as *Hemisphæriodon tasmanicum*, are only among the numerous varieties of *Homolepida casuarinæ*, D. & B. Our chief reason for including the apparently new species under the genus *Hemisphæriodon* was the relatively large size of one of the teeth on each side of each jaw.

The genus *Hemisphæriodon* was separated off from *Hinulia* in 1867 by Peters. It is still considered, and we think rightly, as distinct from *Lygosoma*, in which *Hinulia* and *Homolepida*, with others, are included by Boulenger (B.M.C.).

The synonymy of *Homolepida casuarinæ*, D. & B., then consists of *Omolepidota casuarinæ*, Gray, *Cyclodus casuarinæ*, Dum. et Bibr., *Homolepida nigricans*, Peters, 1874, *Lygosoma muelleri*, Peters, 1878, and *Hemisphæriodon tasmanicum*, L. & F., 1891.

Hemisphæriodon is separated from *Homolepida* thus:—

In *Hemisphæriodon* (1) the pterygoid bones are separated on the median line of the palate, the palatal notch extending anteriorly to an imaginary line connecting the centre of the eyes, (2) lateral teeth with rounded crowns, one on each side of each jaw enormous, the others small.

In *Homolepida (Omolepidota)* (1) the pterygoids are usually in contact anteriorly, the palatal notch not extending forwards to beyond the centre of the eyes, (2) the maxillary teeth conical or obtuse, subequal.

In *H. tasmanicum (casuarinæ)* (1) the palatal notch extends forward to the hind border of the eye, (2) lateral teeth with rounded crowns, one on each side of each jaw much larger than the others, relatively as much larger as in young *H. gerrardii*. Thus this species may be claimed on the first ground by *Homolepida (Lygosoma)*, and on the second ground by *Hemisphæriodon*. Large individuals approach *H. gerrardii* to some extent also in habit. On the whole, pending a more satisfactory classification of the subgenera of *Lygosoma*, it is probably best to leave this variable form under the designation *Lygosoma (Homolepida) casuarinæ*.

DESCRIPTIONS OF NEW SPECIES OF AUSTRALIAN COLEOPTERA.

By Arthur M. Lea.

Part III.

TENEBRIONIDÆ.

Pterohelæus Darwini, n.sp.

Elliptic, convex, subnitid. Piceous; under surface piceous-brown. Head minutely punctate; prothorax and elytra with very minute punctures, the latter with very feeble traces of striæ towards the base; under surface and legs with very minute punctures, those on the legs more distinct; abdomen feebly longitudinally strigose. Apex of tibiæ and tarsi with dense, reddish-brown, short setæ.

Head large; clypeus broad, very feebly emarginate, sides oblique, not at all reflexed, its suture with epicranium indistinct except at sides; feeble trace of a groove between eyes. Prothorax transverse, *at base wider than elytra;* margins flat, moderately wide, widest at base; angles acute, posterior slightly projecting on to prothorax, anterior passing eyes; disc from almost every direction without trace of median line. Scutellum widely transverse, feebly raised. Elytra *soldered together,* narrowing from base to apex, margins narrow, flat and feebly raised about the middle. *Wings rudimentary.* Legs moderate; three basal joints of anterior tarsi dilated (especially in ♂), 4th joint very small, the two apical slightly longer than the three basal, intermediate

Pterohelæus, but has rudimentary wings and elytra soldered together. The wings are gauzy, the veins connecting them with the metanotum are strong but short and abruptly terminated, the wings elsewhere without venation, near the termination of the veins they suddenly contract in width, thence parallel almost to apex, which is truncate. Length 6, width near base 2, width in middle $\frac{3}{4}$, longest vein $1\frac{1}{2}$ mm.

I have examined *Helæus echinatus*, *Saragus rudis* and *Sympetes undulatus*, and find that in all three the metanotum is degraded, soldered to the elytra, and there are but the veriest rudiments of wings. Compared with the metanotum of *P. bullatus* or of *P. convexiusculus*, that of the present species differs in being much more transverse, the apex of a groove in a line with the scutellum marking the apex of a triangular extension, whilst in the two species named the metanotum is parallel; at the base in *Darwini* the angles of the scutellar groove are strongly rounded off, and with another elevation enclose a transverse pointed areolet; in *bullatus* and *convexiusculus* the angles are right angles and enclose a feeble slightly convex depression, the outer edge of which is not ridged; the groove in *Darwini* has a strong flattened edge extending its whole length, in *bullatus* there is a faint trace of ridging, and none in *convexiusculus*.

Pterohelæus Broadhursti, n. sp.

Convex, shining, glabrous. Reddish-brown, margins paler, under surface of head and mandibles piceous. Head densely and rather minutely punctate; prothorax with very minute punctures; each elytron with about seventeen rows of small punctures, and a short sutural row; sterna minutely punctate, abdomen very minutely punctate, and feebly longitudinally strigose.

Clypeus convex, its suture with epicranium distinct, both with reflexed sides; a shallow and moderately distinct impression between eyes; antennæ reaching intermediate coxæ, 3rd joint scarcely as long as 4th-5th combined. Prothorax widely transverse, with very feeble trace of median line, base sinuate, margins

very feebly raised at borders, anterior angles rounded, ...ior acute, slightly recurved. Scutellum transverse, semi...lar, in some lights appearing feebly strigose. Elytra twice ...ng as head and prothorax combined, margins wide on basal ..., narrowing thence to apex. Legs moderate, 1st joint of ...erior tarsi scarcely as long as the rest, of intermediate distinctly ...orter, of posterior as long as basal joint. Length 16, width ...) mm.

Hab.—Pelsart Island (Houtman's Abrolhos), W.A.

In size and shape much the same as *confusus*, Macl. I have named this species after Mr. F. C. Broadhurst, through whose kindness I was enabled to visit this interesting group of islands.

PTEROHELÆUS ABDOMINALIS, n.sp.

Oblong-elliptic, slightly convex, feebly shining, glabrous. Piceous-black, under surface and legs paler; margins, tibiæ and palpi piceous-red. Head and prothorax densely minutely and obsoletely punctate, the former densely and minutely granulate at base; scutellum impunctate; each elytron with about eighteen rows of small punctures, becoming obsolete towards apex; under surface irregularly and feebly punctate; metasternum obliquely, the abdominal segments longitudinally strigose; legs minutely punctate.

Head wider across clypeus than the length to base of eyes, ... convex in the middle, apex feebly emarginate, ... suture almost obliterated. Prothorax ... line, deeply and semi... ...rior angles ...ed,

costa traceable from base to a little beyond the middle. Length 20, width 12 mm.

Hab. Northam, W.A. (Master Percy Snelling).

From the description of *P. dispar*, the above species differs in being larger, its head decidedly broad in front, and the elytral suture slightly raised; my specimen is minus antennæ and tarsi.

PTEROHELÆUS TRISTIS, n.sp.

Oblong-elliptic, slightly convex, feebly shining. Piceous-black; prothoracic margins, tarsi, antennæ and palpi obscure reddish-piceous. Elytra with a few scattered short brownish hairs, scarcely visible to the naked eye, under surface with extremely minute and sparse pubescence. Head densely, minutely and irregularly punctate, and densely and minutely granulate at base, prothorax minutely and not so densely punctate as head, but in addition with extremely dense and almost microscopic punctures; scutellum extremely minutely punctate, elytra striate-punctate (in about eighteen rows), the striæ irregular at both base and apex, the punctures obsolete towards apex; under surface of head feebly granulate, prosternum sparsely and obsoletely, metasternum and abdominal segments distinctly punctate, the three basal segments of the latter feebly longitudinally strigose.

Head subquadrate, clypeus truncate, almost flat, its suture only visible at sides, antennæ flattened and widening to apex, reaching intermediate coxæ. Prothorax slightly convex, broadly transverse, median line unmarked, deeply emarginate in front, margins moderately broad, base feebly bisinuate, posterior angles acute. Scutellum transversely triangular. Elytra convex, parallel-sided to one-third from apex, as wide as prothorax at base, scarcely twice as long as wide, about once and one-half as long as head and prothorax combined, margins very narrow, feebly reflexed near base. Length 20, width 9 mm.

Hab. Mt. Barker, W.A. (obtained under bark of a dead tree).

This species belongs to the 3rd subsection of Sir Wm. Macleay's second section of the genus, from either *P. parallelus* or *P. cereus*

(the only two species belonging to the subsection from W.A size will at once distinguish it. I do not know any species it closely resembles.

P. PARALLELUS, Brême; Mast. Cat. Sp. No. 3756.

Hab.—Bunbury, W.A.

P. BULLATUS, Pasc.; Mast. Cat. Sp. No. 3742.

Hab.—N.S.W., W.A.

P. CEREUS, Macl.; P.L.S.N.S.W. 1887, p. 545.

Hab.—Beverley, W.A.

P. CONVEXIUSCULUS, Macl.; l.c. p. 549.

Hab.—Cootamundra, N.S.W.

P. GLABER, Macl.; l.c. 547.

Hab.—Inverell, N.S.W.

P. HIRTUS, Macl.; l.c. p. 532.

Hab.—Forest Reefs, Sydney, N.S.W.

P. ASELLUS, Pasc.; Mast. Cat. Sp. No. 3740.

Hab.—Tweed and Richmond Rivers, N.S.W.

P. LATICOLLIS, Pasc.; l.c. No. 3750.

Hab.—Forest Reefs, N.S.W.

[redacted]

cleft in front of head, its point obtuse, posterior angles very slightly projecting on to prothorax, disc with a short narrow carina, nowhere angular or pointed. Scutellum transversely cordate, with a semicircular row of shallow irregular foveæ. Elytra widest behind the middle, margins at base raised at about 45°, becoming less towards apex, their outer edge more noticeably curved than in prothorax. Four basal segments of abdomen irregularly impressed at sides. Legs long, claw joint of anterior tarsi almost as long as the rest combined, of intermediate as long as basal joint, of anterior not as long as basal joint. Length 20, width 14mm.

Hab.—Dongarra, W.A. (Mr. G. W. Ward).

The small size of this species will serve to distinguish it from those of its congeners possessing hairy elytra, from the description it appears to be closest to *H. Kirbyi.*

HELÆUS GRANULATUS, n.sp.

Piceous-brown; antennæ piceous-red. Head with shallow, moderately dense punctures; prothorax covered with small, regular, feebly shining granules, margins feebly punctate and very feebly granulate. Elytra feebly striate-punctate, punctures almost obsolete, each bearing a minute erect bristle; seen from above the bristles appear to be all of the same height, but when viewed from behind there are seen to be five rows, between each of which are two rows of almost microscopic setæ; epipleuræ rather strongly and irregularly punctate, under surface with minute punctures and pubescence.

Head feebly grooved between eyes, antennæ reaching intermediate coxæ, 3rd joint longer than 4th-5th combined. Prothorax—including margins—subtriangular, not once and a quarter as wide as long, margins feebly curved, moderately wide, at base depressed, the posterior angles slightly projecting on to elytra, anterior angles subtruncate, right crossing left, disc with a raised shining carina continuous from head almost to base, near base descending at an angle of about 80°. Scutellum feebly raised,

widely transverse. Elytra with suture carinate, each with a shin[ing] costa on 4th interstice terminated at posterior declivity; marg[ins] moderately wide at base, suddenly narrowed and then feebl[y to] apex. Legs moderate, claw joint of anterior tarsi thick, long[er] than the rest combined, of intermediate as long, and of posteri[or] not quite as long. Length 10, width 6½ mm.

Hab.—Mullewa, W.A.

Described from a specimen taken alive; in two found dead (one of which measures 14 × 8 mm.) the elytral punctures are noticeable to the naked eye, and the setæ are sparse and minus the five more elongate rows. The species appears to be closest to *falcatus* from South Australia, from the description of which it differs in not having the anterior angles of prothorax acutely pointed, the elytra dull, and narrow margins without granules.

HELÆUS ECHIDNA, White; Mast. Cat. Sp. No. 3771.

Sir William Macleay's description of this species is somewhat misleading, as he fails to mention the two tubercular spines on the prothorax, and that the sutural rows of spines terminate before the apex of the elytra. The species is readily identifiable by the figure accompanying the original description.

SYMPETES ACUTIFRONS, n.sp.

Broadly ovate, feebly shining. Piceous-brown, margins testaceous, their edges brown, apices of abdominal segments tinged with testaceous. Elytra with very minute, pale, depressed setæ, under surface with moderately dense and very short pubesce[illegible]

...d at base; margins wide, edges recurved; anterior angles ...produced almost to apex of head, posterior sharp and ...ly curved. Scutellum widely transverse. Disc of elytra ...uch wider than that of prothorax, bulged before middle, ...ted near apex, suture strongly raised, interstices irregular, ...aised; margins wide, their edges recurved. Legs moderately ...laws long. Length ♂ 16, ♀ 17, width ♂ 12, ♀ 13½ mm.

...e male the margins are proportionately broader than in ...le, and they are also reflexed.

...Geraldton, W.A.

SYMPETES UNDULATUS, n.sp.

...ining, subparallel. Reddish-brown, margins paler; ...ferruginous. Upper surface with very minute setæ, ...ceable on head and margins than elsewhere. Elytra ...and irregularly punctate, abdomen densely and minutely, ...ins and sterna more coarsely punctate.

...ot projecting beyond prothorax, clypeus wide, perfectly ...n front, very feebly convex, notched at the sides; eyes ...visible, antennæ thin, joints 1st-7th cylindrical, 8th ...ed, 9th-11th circular. Prothorax almost thrice as wide ...disc depressed on each side of middle, at sides and base; ...each wider than disc, each forming the fourth segment ..., anterior angles almost right angles, not at all produced, ...feebly curved and scarcely acute. Scutellum widely .... Disc of elytra as long as prothorax is wide, ovate-...suture strongly raised, each with six or seven feeble ...costæ, the alternate ones stronger, margins waved, in ...most as wide as each elytron, distinctly wider elsewhere, ...rcely recurved and very little darker. Legs long and ...ength 18, width 13 mm.

...ers in being broader and more rounded; a more distinct ... impression at base of prothorax, the anterior angles ...duced, disc of elytra broadly ovate, and, except at base, ...er than margins, outer edges of margins below level of

suture (in ♂ they are higher than the sutural crest), widest about middle (in ♂ the elytra are widest near base, the margins of the middle being slightly inwardly compressed); punctures of epipleuræ coarser. Length 17½, width 14 mm.

Hab.—Geraldton and Walkaway, W.A.

A rather fragile-looking species, having somewhat the appearance of an *Encœra*; the clypeus is straighter than in any species of the subfamily with which I am acquainted. When viewed against a light the margins appear to be thickly impressed with somewhat angular punctures. I have seven specimens under examination, two of which (sexes) measure but 16 mm.

SYMPETES DUBOULAYI, Pasc.; Mast. Cat. Sp. No. 3798.

This species was evidently unknown to Sir Wm. Macleay, as he simply quoted Pascoe's description, and allowed it to remain in *Saragus*. Mr. Champion has since (Trans. Ent. Soc. 1894, p. 384) referred it to its correct genus. The species is moderately common along the coastal regions from Swan River to Geraldton. The posterior angles of the prothoracic, and the anterior of the elytral margins are turned down, a most unusual character in the family.

S. MACLEAYI, Pasc., Mast. Cat. Sp. No. 3789.

LEPISPILUS STYGIANUS, Pasc.; Mast. Cat. Sp. No. 3944.

Mr. Champion (Trans. Ent. Soc. 1895, p. 393) doubts the value of this species. I am convinced that it is a good one, as I have a specimen from Mt. Kosciusko which agrees very well with Mr. Pascoe's description, and which is certainly not *sulcicollis*. My specimen is a male and has faint traces of elytral striæ. From several males of *sulcicollis* in my possession it differs in having the head rougher, the upper part of the eyes distinctly transverse and more coarsely granulate, the prothorax is larger and more convex, with the margins deflexed, a much more distinct impression on each side at base, elytral epipleuræ larger, except at base, where they are smaller, prosternal keel broader, its apex narrower and parallel, intercoxal process depressed and margined; 4th abdominal segment smaller, with the 5th broader; and there are other but less noticeable differences. The entire absence of pubescence is natural, and not due to abrasion. The species is apparently very rare, and my specimen is the only one I have seen.

APASIS PUNCTICEPS, n.sp.

♂. Elongate, slightly convex, shining. Black, with a faint coppery reflection, tarsi and palpi piceous. Prothorax with a few scattered reddish hairs (not always present), inner apical half of tibiæ and the tarsi with dense short brownish pubescence; antennæ feebly pubescent. Head distinctly and densely punctate, [illegible] to labrum, on clypeus some stronger punctures; prothorax densely and very minutely punctate, elytral interstices with occasional punctures, flanks of prosternum and femora obsoletely punctate.

Head with a large irregular transverse impression in the middle, antennæ reaching intermediate femora, slightly thickening towards apex. Prothorax transverse, the sides and base very slightly reflexed, a feeble depression at the posterior angles; base truncate, apex almost so. Scutellum slightly raised, transverse, triangular. Elytra about once and one-half as long as head and prothorax combined, and not much broader than prothorax,

suboval; striate, the 4th and 6th interstices slightly the widest the sutural marked by irregular punctures. Under surface more shining than upper. Femora stout; two small spurs at apex of tibiæ; anterior tarsi dilated. Length 22, width 7 (vix) mm.

♀. Differs in being a little larger and duller, antennæ shorter and thicker, femora thinner, and the anterior tarsi no wider than the others.

Hab.—Mt. Kosciusko (Mr. W. E. Raymond).

Through the kindness of Mr. G. Masters I am enabled to compare the above with *A. Howitti*, from which it differs in being larger, the head distinctly punctate and less shiny, antennæ shorter and thicker (in both sexes), palpi much darker in colour; the prothorax is decidedly transverse (in *A. Howitti* it is—if anything—a little longer than wide); the scutellum is a little broader, the scutellar stria more distinct, and the other striæ are somewhat different at the apex.

MELANDRYIDÆ, ANTHICIDÆ, MORDELLIDÆ.

A paper by Mr. Champion (Trans. Ent. Soc. Lond. 1895), and two by myself (P.L.S.N.S.W., 1894, and 1895) have clashed; and unfortunately several of the names proposed for species in the

Anthicus exiguus, P.L.S.N.S.W. (2). ix. 1894, p. 616.

This name having been used by Mr. Champion for an American species, I propose to alter the name of the Australian species to *rubriceps*.

Mordella Waterhousei, P.L.S.N.S.W. (2), x. 1895, p. 300.

As Mr. Champion (Trans. Ent. Soc. 1895, p. 267) has substituted the name of *Waterhousei* for *obliqua*, Waterh., my name must fall. I therefore propose to alter the name of the Australian species to *Caroli*.

CURCULIONIDÆ

Amycterides

Dialeptopus echinatus, n.sp.

Narrow, deep, elongate-elliptic, subopaque. Piceous; prothoracic crests, elytral tubers and legs dull red; antennæ reddish-brown. Rostrum and space about elytral suture with long blackish setæ; apex of prothorax with short setæ, head with very short depressed pubescence above and below eyes, a patch of whitish scales between eyes, prothorax with sparse elongate and rather small scales at sides; ocular lobes fringed with silvery [illegible] setæ; disc of elytra and tubercles with whitish scales, together with pale brown along suture, lateral punctures filled with whitish-yellow scales, apical segment of abdomen with elongate setæ and a spot of whitish scales.

Rostrum irregularly punctate, grooved in the middle, the ridges, together with those formed by scrobes, forming the letter M. Prothorax with an elevated transversely granulate ridge on each side of middle, the ridges not conjoined at apex but separately overhanging it; the depression between the ridges deepest near apex, becoming shallower and with scattered granules near base, an oblique ridge formed by two irregular rows of granules from base to middle of ocular lobes, a few scattered granules below, there is also a very short intermediate basal ridge of obsolete granules.

Elytra narrow, with two distinct rows of sharp conical tubercles united at base and projecting on to prothorax; the outer row contains six to ten and the inner slightly more tubercles; there is also a short sutural row of from three to five smaller tubercles, commencing at about the middle and terminating at summit of posterior declivity; space between tubercles irregularly punctate; sides with four rows of large punctures, two of which are marginal; posterior declivity with small granules and punctures; apices rounded, very feebly emarginate. Sterna sparsely punctate and with irregular depressions. Two basal segments of abdomen with irregular depressions and ridges, all irregularly and (especially the apical) coarsely punctate at sides, a few feeble punctures across the middle; apical segment with a distinct circular squamose fovea in its middle. Legs long, setose; femora moderately stout; anterior tarsi with an elongate pad on each side, the rest not padded. Length 17, rostrum 2½; width 6 mm.

Hab.—Geraldton and Mullewa, W.A.

I have two specimens, one of which is almost scaleless and has the elytral extension larger, more obtuse and more obtusely granulate than in the other. The species, on account of the number of rows and sharpness of its elytral tubercles, should be very distinct from any previously described. The number of the tubercles in each row is never to be depended upon, as in most of

e marginal, and one irregular touching outer row of : posterior declivity punctate and not granulate, apex and deeply emarginate and separately sharply mucronate. sparsely punctate. Abdomen irregularly and somewhat punctate at sides, suture between 1st and 2nd segment l very distinct at sides, 2nd obliquely scratched, apical the middle and depressed on each side. Legs long, setose, tarsi not padded. Length 12½, rostrum 1⅜; width

-Bridgetown, W.A.

idioides, Pasc., is a species larger than, but intermediate between this and the following species, from either of may be distinguished by its much larger sutural s. The abdomen also is different from that of either of

DIALEPTOPUS SORDIDUS, n.sp.

opaque, moderately broad. Black, apical tubercles on most black, the rest entirely so. Rostrum and apex of x with short blackish setæ. Muddy scales on head eyes, at base of prothorax, and rather densely covering nder surface (except apex of abdomen) glabrous.

um sparsely punctate, a shallow parallel-sided groove ex-ts entire length. Prothoracic crests as in the preceding, hat at apex they are more visibly united, oblique ridge anulate, intermediate ridge more distinct than in either

of tubercles irregularly punctate and obsoletely granulate; six lateral rows of punctures of which only one is distinctly marginal, the upper row irregular and touching tubercles, posterior declivity irregularly punctate and obsoletely granulate; apex semicircularly emarginate and each obtusely mucronate. Sterna sparsely punctate. Two basal segments of abdomen with shallow irregular impressions, except at sides of suture where they are distinct, 2nd segment irregularly feebly obliquely ridged at apex, apical segment with an outer row of coarse punctures, middle with a foveate elevation. Legs moderately long, thin, tarsi not padded. Length 13, rostrum $1\frac{3}{4}$; width $5\frac{1}{2}$ mm.

Hab.—Swan River, W.A.

LÆMOSACCIDES.

LÆMOSACCUS ARGENTEUS, n.sp.

Entirely black. A median stripe on prothorax, a short oblique spot on each elytron conjoined at base (lying on the 1st and 2nd interstices, the two conjointly subobcordate), a small spot on each side of apical abdominal segment, clothed with silvery-white scales; a few whitish scales at apex of elytra, on sterna, and between eyes.

Eyes large, almost touching; rostrum long, shining, cylindrical

strongly convex. Femora edentate, 3rd tarsal joint small. Length $2\frac{1}{3}$, rostrum $\frac{1}{3}$, width $1\frac{1}{3}$ mm.

Hab.—Gosford, N.S.W.

The silvery scales on prothorax and about the scutellum (itself nude), and the entirely black colour of this rather pretty little species are its chief distinguishing features.

Læmosaccus Pascoei, n.sp.

Entirely black. A patch of yellowish pubescence about the scutellum, extending on to the 1st and 2nd interstices to about two-fifths from apex, and a much shorter distance on 3rd, the whole forming an obtuse V, base of pygidium with silvery pubescence, its apex nude; sides of prothorax, sides of sterna and abdominal segments with pale yellow and moderately dense pubescence, rest of under surface with sparser and lighter coloured pubescence; legs (except tarsi) glabrous.

Eyes very large, almost touching; rostrum short, thick, compressed, opaque, grooved, feebly bent and coarsely punctate, 1st joint of funicle thicker and but slightly longer than 2nd. Prothorax with a short feeble irregular carina, on each side of middle a large circular shallow impression feebly open towards apex. Scutellum small, triangular, nude. Elytra about once and one quarter as long as wide, interstices irregular. Anterior legs moderately long, femora very minutely dentate; 3rd tarsal joint moderately bilobed, claw joint rather small. Length $2\frac{1}{3}$, rostrum $\frac{1}{2}$, width 1 mm.

Hab. Clifton, N.S.W.

Læmosaccus carinicollis, n.sp.

Black, legs (femora occasionally piceous) and antennæ dull red, club darker. Above with dull orange-coloured and rather long pubescence as follows:—on the head between eyes, on prothorax at sides and angles (becoming elongate spatulate scales lower down) and a stripe continued from head, at middle of base a patch parallel at commencement but becoming bilobed at the middle (scarcely cordate in shape), on elytra irregularly X-shaped

and sparse at sides and apex. Pygidium with sparse greyish scales. Beneath with yellowish moderately elongate scales, sparsest down the middle. Legs somewhat densely pubescent.

Eyes very large, depressed; rostrum long, shining, distinctly curved, widening to apex, in ♂ densely punctate at base and apex, sparsely punctate in the middle and with oblong punctures at sides, in ♀ more regularly and sparsely punctate; 1st joint of funicle once and one-half as long as 2nd. Prothorax with a shallow longitudinal impression at apex, and a circular one on each side of middle; carina raised, shining, distinct, continuous from before the middle almost to base. Scutellum triangular, subcordate. Elytra moderately long ($3\frac{1}{3} \times 2\frac{1}{2}$ mm.), parallel-sided, interstices flat, granulate. Pygidium obsoletely carinate. Anterior femora with a small tooth moderately distinct in ♂, smaller in ♀; 3rd tarsal joint large, padded beneath with silvery hair, punctate above. Length 6, rostrum $1\frac{2}{5}$; width $2\frac{1}{2}$; range of variation 4-$6\frac{1}{4}$ mm.

Hab.—Mt. Kosciusko (Raymond); Queanbeyan, Tamworth, Forest Reefs, Cootamundra, N.S.W. (Lea): Benalla, Vic. (Helms). Common on freshly felled Eucalypts.

The shining prothoracic carina and long curved rostrum should render this species easy of identification. The pubescence on the upper surface varies from a pale to a dark orange colour, the scutellum is always bare, the pattern on the prothorax, though

[redacted]

across middle, which if united, would form an inverted cross; elytra with a patch about scutellum, from the shoulders oblique to about the middle, then feebly widening for a short distance and terminated about the apical 4th, apex slightly pubescent, 6th 8th interstices slightly pubescent at apical third, and 8th 9th behind shoulders; under surface with moderately dense pubescence at sides, sparser and greyer in the middle.

Eyes large, almost touching. Rostrum moderately long, curved, shining, cylindrical, rather finely punctate. First joint of funicle thick, transverse, distinctly longer than 2nd; club as long as funicle. Prothorax bulged out in the middle, a longitudinal impression at base and apex, and a transverse one on each side of middle. Scutellum rounded, shining. Elytra moderately long, interstices transversely granulate. Pygidium carinate. Undersurface strongly convex, intermediate segments of abdomen with very distinct sutures. Femoral tooth very small, claw joint of tarsi moderately prominent. Length 3½, rostrum ⅘; width 1¼ mm. Range of variation very slight.

Hab. Clifton, Galston, Forest Reefs, N.S.W.

In build resembling *carinicollis*, but somewhat narrower, and without the shining prothoracic carina so distinct in that species. In one specimen I possess the patch of elytral pubescence is much smaller: it only extends to about the basal third, with a few spots about the apical third near the suture, and two very small spots on the 8th interstice.

Lemosaccus funereus, Pasc.; Mast. Cat. Sp. No. 5325.

I have a male insect from Armidale which agrees very well with Mr. Pascoe's description of this species, except that the rostrum and legs (tarsi excepted) are black; but as both these are liable to sexual variation of colour, and Pascoe's specimen may have been a female, I have considered it inadvisable to describe it as new. Length 3½, rostrum ½, width 1⅔ mm.

Læmosaccus dubius, n.sp.

♀. Black, antennæ red, club and tarsi reddish piceous. Under surface and legs microscopically pubescent

Eyes large, distinctly but not widely separated. Rostrum straight, moderately elongate, shining, cylindrical, sparsely punctate. Antennæ long, scape almost straight, thin but thickened at apex; 1st joint of funicle large, twice as long as 2nd; club large, almost as long as funicle. Prothorax with a longitudinal impression feeble in the middle, much stronger towards apex, causing the surface near it to appear raised, each side of base with an oblique elliptic and distinct impression. Scutellum transverse. Elytra wide, rather coarsely granulate, separately convex, 4th interstice widest. Pygidium large, without trace of carina. Legs moderately long, anterior femora with a very small basal tooth, the intermediate with a larger, sharper and more median tooth, claw joint distinct. Length 5⅓, rostrum 1; width 2⅓ mm.

Hab.—Braidwood, N.S.W.

This species also almost fits Mr. Pascoe's description of *funereus*, but as it was obtained in a mountainous district much farther south, and both species cannot be *funereus* (which evidently belongs to the group about *subsignatus*, *carinicollis*, *narinus*, &c.) I have given it a name. From the specimen mentioned above as possibly *funereus* it differs in being considerably larger, without trace of pubescence on the upper surface, longer and straighter scape, darker tarsi, longer claw joint, and in several other details which may possibly be sexual

2nd, club not as long as joints 2nd-7th. Prothorax rounded, a feeble longitudinal impression down middle, and a feeble transverse one near apex. Scutellum small, round, not in a depression. Elytra nearly once and one-half as long as wide, convex, interstices flat, very minutely granulate, those near the suture wider than towards the side. Pygidium with traces of a longitudinal carina. Legs short, anterior femora with a moderately large basal tooth, 3rd tarsal joint deeply bilobed, but not much wider than 2nd, claw joint long, very distinct. Length $4\frac{3}{4}$, rostrum 1, width $1\frac{3}{4}$ mm.

Hab.—Sydney, N.S.W.

The elytra are more convex, with the interstices more feebly granulate than is usual in the genus. A slight resemblance to some of the broader species of *Cossonus* has suggested the specific name.

LEMOSACCUS COMPACTUS, n.sp.

♂. Black, antennæ (club piceous) and tarsi dull red. Above and below with very sparse greyish pubescence.

Eyes widely separated. Rostrum short, thick, straight, opaque, coarsely punctate and grooved for its entire length. Antennæ short, scape not twice the length of 1st joint of funicle, club large, compact. Prothorax rounded, a feeble carina at base, on each side of which is an almost circular and very distinct impression. Scutellum transverse, placed in a sutural depression. Elytra scarcely longer than wide, interstices broad, coarsely granulate. Pygidium feebly carinate. Legs short, anterior femora with a small tooth, claw joint very distinct. Length $1\frac{2}{3}$, rostrum $\frac{1}{3}$, width $\frac{3}{4}$ mm.

Hab.—Sydney, N.S.W.

A small, dumpy, and rather strongly marked species, the size of which should alone be sufficient to render its identification easy.

LEMOSACCUS FESTIVUS, n.sp.

Black, antennæ, tarsi and apex of tibiæ dull red. Golden yellow pubescence on prothorax at sides and apex, and encroaching

on the base, leaving a large discal patch nude; elytra with a transverse patch at base narrowing and then slightly widening to the middle, behind it at a third from apex a small patch, and between these on 5th-7th interstices another small patch, the whole enclosing (to the naked eye) an elliptic bare space; pygidium and apical segment of abdomen with sparse greyish scales; under surface bare.

Eyes moderate, approximate. Rostrum short, straight, cylindrical, shining, almost impunctate; scape short, curved; 1st joint of funicle enlarged, not once and one-half the length of 2nd; club large. Prothorax subquadrate, a distinct impression on each side at base; a median line invisible from most directions. Scutellum small, subtriangular, not in a depression. Elytra somewhat convex, about once and one-third as long as wide, interstices narrow, transversely granulate. Pygidium with a short moderately distinct carina. Femora edentate, claw joint small, partially concealed. Length $2\frac{1}{3}$, rostrum $\frac{1}{3}$; width $\frac{4}{5}$ mm.

Hab.--Tamworth, N.S.W.

A prettily marked little species but with no distinct structural features.

LÆMOSACCUS OBSCURUS, n.sp.

[redacted]

moderately wide, transversely granulate. Propygidium dium small, feebly carinate. Anterior legs moderately edentate, tarsi narrow, 3rd joint deeply but not very bed, padded with silvery hair beneath, claw joint small, distinct. Length $2\frac{1}{4}$, rostrum $\frac{1}{2}$ (vix), width $\frac{5}{6}$ mm.

in having the rostrum shining, much less densely subcylindrical; club smaller; pubescence paler and

mworth and Armidale, N.S.W.

he few species in which the scutellum is not situated of a sutural depression; it is rather obscure and may trouble to identify, though evidently distinct from any to me. From the preceding it differs in colour of antennæ, markings on prothorax and elytra, slightly joint, and has a more angular outline.

Læmosaccus ater, n.sp.

; antennæ (club piceous) and tarsi red. A few short hairs about base and across apical third of elytra; sterna with sparse and very minute scales

, not widely separated. Rostrum short, straight, ndrical, finely punctate. Scape short, feebly curved, funicle large, the rest indistinctly jointed, club long as funicle. Prothorax convex, a short distinct apex, a feeble impression on each side at base, and ession almost at sides in middle. Scutellum small, ble depression. Elytra moderately long, interstices w, convex, transversely granulate. Pygidium very ate. Anterior femora edentate, claw joint small, distinct. Length $2\frac{1}{3}$, rostrum $\frac{1}{2}$, width $\frac{4}{5}$ mm.

mworth, N.S.W.

wo specimens, both apparently females. The claw small, is not so minute as in *cryptonyx* and a other species.

LÆMOSACCUS VARIABILIS, n.sp.

♂. Head, base of rostrum, prothorax (apex tinged with red), scutellum, pygidium, under surface and base of femora piceous-brown or black; rest dull red, sides and base of elytra sometimes tinged with piceous. Under surface and sides of prothorax microscopically and very sparsely pubescent.

Eyes moderately large, prominent, subapproximate. Rostrum short, thick, curved, coarsely punctate; the two colours separated by a raised and triangular emargination, base feebly grooved. Antennæ short, 1st joint of funicle thick, club almost as long as funicle. Prothorax with an almost obsolete median and punctate carina, each side of base with a distinct transverse impression, and an almost invisible depression on each side of middle. Scutellum small, elongate, depressed. Elytra noticeably wider than prothorax, shoulders produced, oblique, apex feebly rounded; suture depressed, more distinctly towards scutellum, interstices narrow, strongly (for the genus) convex. Pygidium feebly punctate. Basal segment of abdomen with a shallow but distinct impression in its middle at suture with 2nd. Anterior legs moderately long, femora edentate, claw joint very small, scarcely extending beyond lobes of 3rd. Length 2, rostrum $\frac{1}{2}$ (vix); width $\frac{3}{4}$, range of variation $1\frac{4}{5}$-$2\frac{1}{2}$ mm.

[redacted]

Swan River, W A.

the numerous specimens of *variabilis* I have examined ien and pygidium are entirely black, and neither of the esses a femoral tooth, in my specimen of the above the ugh small, is distinct and would seem to imply specific

LÆMOSACCUS RUFIPENNIS, n sp.

elytra (except sides and apex), antennæ (club tinged or piceous), and tarsi dull red; apex of prothorax and sionally tinged with red. Pygidium with silvery scales; of under surface each with a small whitish scale.

rge, approximate. Rostrum short, straight, shining, l, very finely and sparsely punctate. Scape short, disrved; 1st joint of funicle large, twice the length of 2nd; s long as funicle. Prothorax rounded, a longitudinal very distinct at apex, feebly or not at all continued to with an almost obsolete or moderately distinct impresse, traces of a transverse impression on each side of tellum small, round, situate in a depression. Elytra e and one-third as long as wide, conjointly feebly wards apex, separately towards base, interstices narrow, onvex, very minutely granulate, the fifth with several ree) transverse and distinct granulations towards its apex. densely punctate and with a shining impunctate al carina. Femora with a small tooth 3rd tarsal joint

specimens of this species I have under examination, both sexes are present, the difference is but slight: those I take to be males have a slightly larger club and broader elytra, the prothorax always entirely black, and the tarsi feebly tinged with piceous.

LÆMOSACCUS INSTABILIS, n.sp.

♂. Black; antennæ and tarsi pale red, rostrum piceous, its apex sometimes dull red, tip of femora and tibiæ and extreme apex of elytra tinged with red. Pygidium and under surface almost nude.

Eyes large, prominent, almost touching. Rostrum straight, short, shining, perfectly cylindrical, with feeble elongate punctures. Antennæ short, scape very short, inserted at eyes, almost geniculate, 1st joint of funicle large, transverse, distinctly wider than scape, rest of the joints short, thick, their combined length not equalling club. Prothorax with bulged sides, much more strongly punctate than usual in the genus, with a distinct longitudinal furrow extending its entire length, a small and distinct impression on each side of middle. Scutellum small, circular, within a depression. Elytra about once and one-third as long as wide, feebly curved inwardly behind the shoulders, interstices narrow, convex, transversely granulate. Pygidium feebly carinate, seen [redacted]

s antennæ inserted so close to the eyes as to leave no
e between them, the strongly bent scape, the unusually
int of funicle, and the distinct median groove on the
render this species despite the variable colour of
—perhaps the most distinct of any in the genus.
g *vacuabum* at first sight, the straight rostrum alone
inguish it, the preceding species (which it resembles
ce) has the antennæ inserted about the basal third.

LAEMOSACCUS RUFIPES, n sp.

g rostrum, antennæ and legs red. Pygidium feebly
s base.

derately separated Rostrum short, straight, shining,
finely punctate. Antennæ inserted moderately close
ape short, curved, not twice the length of 1st joint of
b very small. Prothorax rounded, a feeble impression
ntinued but very feebly to near base, base with a sub-
pression on each side. Scutellum small, triangular,
a depression. Elytra parallel-sided, about once and one-
ng as wide, interstices narrow, convex, scarcely granu-
idium not carinate. Anterior femora with a small but
inct tooth, claw joint very small Length $2\frac{1}{3}$, rostrum
dth $\frac{4}{5}$ mm.

ydney, Galston, N S.W.

gate parallel sided species, somewhat resembling *musta*
without a distinct median prothoracic line, and the
ot inserted at extreme base of rostrum though closer
usual. I have two specimens, both females.

ACCUS GIBBOSUS, Pasc.; Mast. Cat Sp. No. 5326.

ecies was described from a male specimen, the female
bed as *L. magdalinides* by the same author I think it
that the sexes of other species have received separate
Of the above I have a pair taken *in cop* The rostrum
s of the legs are often subject to sexual variation; in

some species the eyes are much closer to each other in the ma than in the female, and the length of the anterior femora occasio ally varies.

LÆMOSACCUS QUERULUS, Pasc.; Mast. Cat. Sp. No. 5334.

Mr. Pascoe has described only the female of this species; the male differs in having the rostrum thick, compressed, opaque, narrowing to apex, coarsely punctate and grooved for its entire length, or sometimes even carinate. I have numerous specimens from various parts of New South Wales and Swan River; the size ranges from 3 to 6 mm.; the elytral fasciæ are variable both in size and completeness; *L. narinus*, Pasc., is possibly a black variety.

LÆMOSACCUS AUSTRALIS, Boisd.; Mast. Cat. Sp. No. 5318.

I do not know how this species crept into the Catalogue, as Boisduval described it from New Guinea; and neither Pascoe nor Bohemann (the only two who have described Australian *Læmosacci*) mentions it as coming from Australia, though Pascoe compares several species with it.

LÆMOSACCUS CRYPTONYX, Pasc.; Mast. Cat. Sp. No. 5321.

In this species the clothing varies from pale yellow to dark

L. LONGIMANUS, Pasc.; l.c. No. 5328.

Hab.—Queanbeyan, N.S.W.

L. NARINUS, Pasc.; l.c. No. 5330.

Hab.—Forest Reefs, Queanbeyan, N.S.W.

L. NOTATUS, Pasc.; l.c. No. 5331.

Hab.—Tweed River, N.S.W.

L. OCULARIS, Pasc.; l.c. No. 5332.

Hab.—Forest Reefs, N.S.W.; Darling Ranges, W.A.

L. SUBSIGNATUS, Bohem.; l.c. No. 5336.

Hab.—Tasmania (Simson's No. 2566).

L. SYNOPTICUS, Pasc.; l.c. No. 5337.

Hab.—Forest Reefs, N.S.W.

In the following tabulation of species known to me I have excluded as far as possible all characters subject to sexual variation, where I do not know both sexes.

Rostrum more or less noticeably curved.	
Prothorax with a distinct circular or elliptic impression on each side at base.	
Eyes almost touching.	
Clothed above...	*argenteus*, n.sp.
Glabrous above.	
Abdomen black...	*variabilis*, n.sp.
Abdomen red	*ventralis*, n.sp.
Eyes rather widely separated......................	*narinus*, Pasc.
Prothorax without or with almost invisible impressions at base.	
Scutellum within a depression.	
Posterior femora passing pygidium..........	*notatus*, Pasc.
Posterior femora not reaching apex of elytra.	
Rostrum long and shining......	*ocularis*, Pasc.
Rostrum short and opaque.........................	*electilis*, Pasc.
Scutellum not within a depression.	
Derm red..........	*cossonoides*, n.sp.
Derm black.	

Prothorax with shining carina. .... *carinicollis*, n.
Prothorax without shining carina.
Anterior femora edentate......................... *synopticus*, Pas
Anterior femora with small tooth.
Prothoracic impressions pubescent. ... . *crucicollis*, n.sp.
Prothoracic impressions impubescent. .... . *Pascoei*, n.sp.
Rostrum straight.
Scape inserted at extreme base of rostrum......... .... . *instabilis*, n.sp.
Scape not inserted at extreme base of rostrum.
Form short and thick.
Size very small......... ... . *compactus*, n.sp.
Size larger.
Prothorax without basal impressions............ . *dapsilis*, Pasc.
Prothorax with basal impressions.
Elytra more or less red....................... .. .. *querulus*, Pasc.
Anterior legs moderately long.
Anterior femora reaching apex of rostrum *longimanus*, Pasc.
Anterior femora not reaching apex of rostrum.................... .... *subsignatus*, Boh.
Anterior legs short.
Feebly pubescent above .... *funereus*, Pasc.?
Glabrous above.. . ... *dubius*, n.sp.
Form rather elongate and subcylindrical.
Elytra and prothorax with distinct pubescence

[redacted]

COSSONIDES.

MASTERSINELLA, n.g.

d small. *Eyes* small, prominent, coarsely granulate. m cylindrical, parallel, elongate. *Antennæ* thick; funicle d; club 3-jointed. *Prothorax* distinctly widest behind, ly longer than wide. *Scutellum* small, distinct. *Elytra* wider than prothorax, subcylindrical, apex acuminate. *coxæ* subapproximate; tibial hook sharp, very distinct; eudo-tetramerous. *Body* fusiform, strongly sculptured, l.

ight-jointed funicle renders this genus at once distinct r recorded by Mr. Wollaston; though, had specimens been im, he might have considered it necessary to form a special as in *Notiomimetides*) to receive it. So far as I am of judging, its nearest Australian ally (although possessing inted funicle) appears to be *Microcossonus* (of which a s herein recorded from New South Wales). Consequently se to treat it as an aberrant form belonging to the *rides*.

MASTERSINELLA 8-ARTICULATA, n.sp.

red; rostrum and base of prothorax feebly tinged with Legs with feeble greyish pubescence. Head impunctate, arse punctures between eyes, rostrum with coarse scattered es densest towards apex; prothorax with regular shallow es. elytra striate-punctate, the punctures large, shallow, nate, tinged with piceous, interstices smooth. Under side feebly transversely strigose, sterna and alternate portions nen with large shallow punctures.

um once and one-half as long as head, feebly equally owards apex; 1st joint of funicle wider than long, narrow apex truncate, rounded outwardly, inwardly excavated. ax subconvex, not once and one-half as long as wide, nded, apex narrowed and feebly constricted, base feebly e. Elytra slightly wider than prothorax, parallel-sided to

apical third. Meta- twice as long as mesosternum, the two bined as long as abdomen. Third tarsal joint strongly bil entirely concealing true 4th joint except from below. Leng eyes $1\frac{3}{4}$, rostrum $\frac{1}{3}$; width $\frac{1}{2}$ (vix) mm.

Hab.—N. Queensland (Mr. G. Masters), Barron Falls (Mı Koebele). "In decaying timber."

HEXARTHROIDES, n g.

Head rather small. *Eyes* small, prominent, coarsely gran *Rostrum* subcylindrical, parallel. *Antennæ* moderately sle funicle 6-jointed; club 3-jointed. *Prothorax* widest across m longer than wide. *Scutellum* almost invisible. *Elytra* sub drical, parallel, apex acuminate. *Anterior coxæ* subapproxi tibial hook distinct; tarsi pseudo-tetramerous, 3rd joint moder bilobed *Body* elongate, narrow, strongly sculptured, f pubescent.

Although possessing a six-jointed funicle, I think this should go in with the *Cossonides* as limited by Mr. Wolls he himself places *Hexarthrum* (also with a six-jointed fu with them, and the present genus certainly cannot be placed the *Onycholipides*. I possess no Australian genus with whi can be satisfactorily compared, and from *Hexarthrum* it ap to differ widely.

ie head and rostrum elongate pear-shaped. Elytra much
han prothorax at base, but not much wider than across its
, parallel-sided to near apex, interstices very narrow.
ien a little longer than meso- and metasternum combined.
to eyes $2\frac{1}{6}$, rostrum $\frac{1}{3}$; width $\frac{1}{2}$ mm.
—Galston, N.S.W.

MICROCOSSONUS PANDANI, n.sp.

onvex. Dull red, antennæ and under side of head paler.
ith feeble scattered pubescence. Head both above and
feebly transversely strigose; rostrum with shallow
res; prothorax with shallow, almost regular punctures.
striate-punctate, the punctures large, shallow, approximate;
urface with scattered large shallow punctures, and minutely
irly transversely or obliquely strigose; femora feebly
.

e feebly curved, slightly longer than the rest of antennæ;
it of funicle longer than 2nd-3rd combined. Prothorax
constricted near apex, which is decidedly narrower than
ase very feebly trisinuate. Elytra feebly and equally
shing to apical third. Length to eyes $1\frac{1}{2}$, rostrum $\frac{1}{3}$ (vix);
$\frac{2}{3}$ mm.
.—Tweed and Richmond Rivers, N.S.W.
reen decaying portions of the trunks and in old nuts of
nus sp. The species is moderately common and I have
both larvæ and pupæ, specimens of which are now in the
ion of the Department of Agriculture of New South Wales.

STEREOBORUS LAPORTEÆ, n.sp.

ndrical, shining, glabrous. Black or piceous-black, or piceous-
. Head, rostrum and prothorax densely punctate; elytra
ite striate, the punctures large, subquadrate, interstices
, very sparsely punctate; under surface sparsely, sides of
more densely punctate.
d broad; eyes indistinct; rostrum very broad, not much
than wide, feebly decreasing to apex, a feeble impression

between antennæ; antennæ short, scape curved, as long as fun Prothorax slightly narrowed in front, as long as head and rostr combined, without trace of median line. Scutellum small, tra verse. Elytra parallel to near apex, suture slightly conve Sutures of intermediate abdominal segments very deep. Le short, anterior tibiæ fossorial. Length 5, rostrum ½; width 1¼ mm

Hab. Clarence River, N.S.W.

Numerous specimens taken from partly decayed trunks of th large stinging tree (*Laportea gigas*). The great number of closely allied genera described by Mr. Wollaston renders satisfactory determination of any but those with strongly marked features somewhat difficult, and as this and the following species are at least very close to *Stereoborus* (a species of which has already been recorded from Australia) I have considered it advisable to place them in that genus.

STEREOBORUS INTERSTITIALIS, n sp.

Elongate elliptic, subconvex, shining, glabrous. Black, antennæ and tarsi piceous. Head (except base) and rostrum densely punctate, prothorax less densely; elytra striate-punctate punctures moderately large, approximate, interstices flat, feebly but distinctly punctate, sterna with moderately large regular

[redacted]

Stereoderus Macleayi, n.sp.

Cylindrical, highly polished, glabrous. Black, antennæ piceous-red. Head and rostrum almost impunctate, mouth parts with long reddish hair, prothorax with sparse distinct punctures, sparsest towards base; elytra with regular rows of small distinct punctures, interstices flat, not punctate.

Head large, thick; eyes lateral, indistinct, a very feeble impression between them; rostrum very short, wider than long, antennæ nserted about middle of rostrum, scape very short, widening to pex, feebly curved. Prothorax about once and one-third as ong as wide, feebly constricted near apex, which is slightly narginate at its middle, and almost as wide as base. Scutellum istinct, subquadrate, within a depression. Elytra parallel to ear apex, with an indistinct sutural stria. Intermediate gments of abdomen short, their sutures deep and wide. Legs ery short, tibiæ strongly fossorial. Length $4\frac{1}{5}$, rostrum $\frac{1}{2}$; idth $1\frac{1}{3}$, rostrum $\frac{3}{4}$ mm.

Hab.—Cairns, N.Q. (Macleay Museum).

Except for the shape of the prothorax this species agrees with Mr. Wollaston's diagnosis of the genus *Stereoderus;* the base of he rostrum has three small tubercles immediately behind the ong reddish hair with which the mouth is fringed.

Cossonus integricollis, n.sp.

Broad, depressed, feebly shining. Head and prothorax black, lytra and scutellum dull brownish-red, the former tinged with iceous towards apex; under surface, legs and antennæ piceous-rown. Rostrum with dense small punctures, prothorax with rge regular punctures except at apex where they are smaller, ach elytron with about twelve rows of large, subquadrate unctures; interstices scarcely visibly punctate, about as wide as unctures; under surface densely punctate, punctures of sterna specially of pro- and mesosternum) stronger.

Eyes lateral, distinct; rostrum narrow at base, sudde widening to insertion of antennæ, parallel thence to a antennæ inserted about middle of rostrum, scape straight, as l as funicle, club short, obovate. Prothorax subconical, me line invisible on apical half, carinate towards base, base bisinu Scutellum small, distinct, circular, within a depression. El wider than prothorax, parallel to apical third, interstices scarcely raised (except posteriorly). Abdomen with a fe depression at middle of 1st and 2nd segments; apical as lon two intermediate combined. Legs long, femora (especially ante thickened. Length $4\frac{1}{3}$, rostrum 1 (vix); width $1\frac{2}{3}$ mm.

Hab.—Forest Reefs, N.S.W.

Crawling over fences and logs at night time.

COSSONUS IMPRESSIFRONS, n.sp.

Elongate, depressed, feebly shining, glabrous. Piceous-b under surface (except prosternum), legs and antennæ red brown. Head and rostrum densely punctate, the prothorax densely but more strongly; elytra striate-punctate, punc large, subquadrate, interstices scarcely visibly punctate, pro mesosternum with dense coarse punctures, on the mesoster and two basal segments of abdomen they are smaller and s what irregular, intermediate segments sparsely punctate, a

extending from base of 1st to apex of 2nd abdominal segment. Legs moderately long, femora (especially anterior) thickened. Length 6½, rostrum ⅔; width 1⅔ mm.

Hab.—New South Wales (probably from Sydney).

COSSONUS PRÆUSTUS, Redt.; Mast. Cat. Sp. No. 5620.

Hab.—N.S.W.; widely distributed.

PENTAMIMUS RHYNCHOLIFORMIS, Woll.; l.c. No. 5615.

Hab.—Donnybrook, W.A. In flowering stems of *Xanthorrhœa.*

P. CANALICULATUS, Woll.; l.c. No. 5614.

Hab.—Tasmania (Macleay Museum).

ISOTROGUS BILINEATUS, Pasc.; l.c. No. 5621

Hab.—Cairns, N.Q. (Macleay Museum).

DESCRIPTIONS OF SOME NEW ARANEIDÆ OI SOUTH WALES. No. 6.

By W. J. Rainbow.

(Plates xviii.-xx.)

Family EPEIRIDÆ.

Genus Nephila, Leach.

Nephila ornata, sp.nov.

(Plate xviii. figs. 1, 1*a*, 1*b*.)

♀. Cephalothorax 5 mm. long, 4 mm. broad; abdomer long, 4 mm. broad.

Cephalothorax dark mahogany brown, thickly clothe silvery white hair; *caput* elevated, rounded on sides an part, deeply compressed at junction of cephalic and segments; two coniform tubercles at posterior extremity of segment. *Clypeus* broad, moderately convex; a deep tr

Falces dark brown, conical, smooth, inner margin fringed with dark hairs; fangs much darker; the margins of the furrow of each falx armed with a row of three strong teeth.

Maxillæ dark at base; apex shiny, pale yellowish.

Labium longer than the base is broad; base and apex similar in colour to maxillæ.

Sternum shield-shaped, straw colour, with small dark patches laterally.

Abdomen oblong, sinuous in outline, moderately convex, projecting over base of cephalothorax; superior surface dull yellowish, dark at anterior and posterior extremities, clothed sparingly with short silvery hairs; ornamented with a few dark spots, and from near the centre to anterior extremity with a network pattern of dark lines; sides and inferior surface dark brown, ornamented with a network of pale yellowish and uneven lines.

Epigyne a transverse oval, dark brown eminence, posterior lip more strongly elevated and convex than the anterior.

Hab.—Sydney.

(Contribution from the Australian Museum.)

NEPHILA PICTA, sp.nov.

(Plate XIX. fig. 1.)

♀. Cephalothorax 6 mm. long, 5 mm. broad; abdomen 11 mm. long, 7 mm. broad.

Cephalothorax shiny black, thickly clothed with silvery hairs; *caput* arched, clothed with silvery hairs, a few black shiny patches devoid of hairs; junction of cephalic and thoracic segments clearly defined; two shiny black coniform tubercles at base of cephalic eminence. *Clypeus* broad, slightly arched, clothed with silvery hairs; normal grooves distinct, black, shiny, and devoid of hairs; deeply indented at centre. *Marginal band* narrow, fringed with hoary hairs.

Eyes black; the four central eyes are seated on a moderately convex eminence, and form an almost quadrangular figure, the lateral pair are much the smallest, and are placed obliquely on small tubercles, but are not contiguous.

Legs long, slender, black, with broad yellow annulations; *trochanters* and *femurs* of first 2 pairs and femurs only of third and fourth pairs furnished at lower extremities with long black hairy plumes; *tibial joints*, *metatarsi* and *tarsi* black.

Palpi long, black, clothed with long black hairs or bristles.

Falces black, arched in front, slightly divergent, a few short black hairs on inner margins; a row of three teeth on each margin of the furrow of each falx wherein the fang lies when at rest; fangs black.

Maxillæ club-shaped, arched, outer margins black, inner margins shiny, yellowish.

Labium conical, rather longer than broad, black at base, shiny and yellowish at apex.

Sternum cordate, longer than broad, surface uneven, black, with four small yellow lateral patches, a broad transverse curved yellow band at anterior part, and a small yellow patch at posterior extremity.

Abdomen ovate, projecting over base of cephalothorax, superior surface sparsely pubescent, olive green, spotted with yellow and

Genus Epeira, Walck.

Epeira picta, sp. nov.

(Plate XVIII. figs. 2, 2a.)

alothorax 3 mm. long, 2 mm. broad; abdomen 5 mm. broad.

orax pale yellow. *Caput* elevated, rounded on sides part, a few short fine pale yellow hairs in front and at ens broad, strongly convex, normal grooves indistinct. and narrow.

ck; the four intermediate ones seated on a somewhat ar protuberance, forming a square or nearly so, of pair comprising the first row are separated from each distance equal to their individual diameter, those of by about one half, and each row is separated from the bout the diameter of one eye; lateral pairs much the the group, placed obliquely on small protuberances, contiguous.

derately long and strong, pale yellow, armed with spines, and sparingly clothed with short fine yellow ive lengths 1, 2, 4, 3.

ort, pale yellow, clothed with fine yellow hairs, con- onger than those of the legs.

le yellow, strong, the margins of each falx armed with ree teeth; fangs yellowish brown.

pale yellow, arched, inner margins thickly fringed hairs.

concolorous, broad at base, strongly arched, one-half of maxillæ.

cordate, yellowish-green, truncate in front, bare and

broad, ovate, overhanging base of cephalothorax nvex, green colour, with two large yellow spots, edged brown towards anterior extremity, contiguous to each here is a much smaller yellow spot edged with dark

brown; towards posterior extremity there is a network dark and uneven lines; sides of a somewhat darker gr superior surface; underside olive green.

Epigyne an elevated eminence; the two openings, sensibly separated, are connected at anterior part witl yellowish curved bar; immediately above the curved bar m there is another bar larger, stronger, and much more arcl the first mentioned.

Hab.—New England District.

Epeira similaris, sp.nov.

(Plate xviii. fig. 3.)

♀ Cephalothorax 3 mm. long, 2 mm. broad; abdome long, 5 mm. broad.

Cephalothorax pale yellow. *Caput* elevated, rounded and upper part, a few short fine pale yellow hairs in fro sides. *Clypeus* broad, strongly convex; normal grooves i *Marginal band* narrow.

Eyes, legs, palpi, falces, maxillæ, labium and *sternum* s *E. ficta.*

Abdomen broad, ovate, overhanging base of cepha moderately convex, green, with a broad transverse irregu

EPEIRA WAGNERI, sp.nov.

(Plate XIX. figs. 2, 2*a*, 2*b*, 2*c*, 2*d*.)

♀. Cephalothorax 5 mm. long, 4 mm. wide; abdomen 6 mm. long, 5 mm. wide.

Cephalothorax yellow-brown. *Caput* elevated, rounded on sides and upper part. *Clypeus* broad, convex, normal grooves indistinct; a deep transverse cleft at centre. *Marginal band* narrow, black.

Eyes black; the four central eyes forming a square or nearly so; front pair separated from each other by about one eye's diameter, second pair by a distance equal to about three-fourths of their individual diameter; lateral pairs seated obliquely on tubercles, much the smallest of the group.

Legs long, strong, clothed with short black hairs and spines; coxæ pale straw colour; *trochanters* with lower half pale straw colour, the remainder reddish-brown; *femurs*, *tibiæ* and *tarsi* reddish-brown. Relative lengths 1, 2, 4, 3.

Palpi long, similar in colour and armature to legs.

Falces reddish-brown, shiny, inner margin fringed with short hairs; the outer margin of the furrow of each falx armed with three teeth, and the inner two; fangs strong, dark brown.

Maxillæ yellow-brown, convex exteriorly, a thick fringe of short black hairs on inner margins, a few long black ones on the outer margins.

Labium broad, half the height of maxillæ, rounded off at apex.

Sternum shield-shaped, dark brown, lighter at the middle; surface uneven.

Abdomen oblong, convex, slightly projecting over base of cephalothorax; upper surface mottled yellow and brown; at anterior extremity two large dark and brown patches laterally; four rather deep indentations at the centre; a large leaf-like design, darkest at its outer edges, runs the entire length of the upper surface; sides mottled dark brown and yellow, with green markings; inferior surface yellowish, with dark brown patches.

The males of this species are pigmies in comparison to the females, but are exactly like them in colour and formation. The sexes pair during January and February, and live together in the same nest during that period. A more detailed account of their nidification, &c., will be found in another part of this paper. I have much pleasure in dedicating this species to my esteemed contemporary and correspondent, Professor Waldemar Wagner, of Moscow, who has published an admirable work, "L'Industrie des Araneina," in the "Mémoires de L'Académie Impériale des Sciences de St. Pétersbourg. vii^e Série. Tome xlvii. No. 11."

Hab.—Sydney

Family LYCOSIDÆ.

Genus Dolomedes, Latr.

Dolomedes neptunus, sp.nov.

(Plate xviii., figs. 4, 4*a*.)

♀ Cephalothorax 4 mm. long, 3 mm. broad; abdomen 3 m[illegible] long, 5 mm. broad.

Cephalothorax pale yellowish, strongly convex, clothed with p[illegible] yellowish pubescence; normal grooves and indentations indistin[illegible]

[redacted]

on the underside seated much nearer to the apex than those of the upper margin; fangs long, dark brown.

Maxillæ long, arched in front, inclining inwards, thickly clothed with pale yellowish pubescence.

Labium half as long as maxillæ, coniform, arched in front, pale yellowish, thickly clothed with yellowish pubescence.

Sternum elliptical in outline, dark brown, shiny, clothed with yellowish pubescence.

Abdomen oblong, pale yellow, slightly projecting over base of cephalothorax, clothed with yellowish pubescence, and ornamented with dark brown spots, flecks, and at posterior extremity a rectangular figure; sides and inferior surface pale yellowish with yellow pubescence.

Epigyne a curved transverse slit.

Hab.—The shores of Port Jackson.

DOLOMEDES SPINIPES, sp.nov.

(Plate XVIII., fig. 5).

♀. Cephalothorax 3 mm. long, 2 mm. broad; abdomen 4 mm. long, 2 mm. broad.

Cephalothorax pale yellowish, convex, clothed with coarse yellowish hairs, normal grooves and indentations indistinct. *Caput* elevated, rounded on sides and upper part, shiny, a few long coarse hairs at sides and in front. *Marginal band* broad.

Eyes black; front row smallest of the group, slightly procurved, middle eyes somewhat larger than their lateral neighbours, all equidistant; eyes of second row large, separated by a space equal to once their individual diameter; third row same size as those of the second, but separated from each other by four diameters.

Legs moderately long, strong, yellowish, thickly clothed with coarse yellowish hairs, and on upper sides of trochanters and femurs short, strong black spines; on the under sides of these joints long, strong black spines; *tibial and tarsal joints* furnished

above and below with long, strong black spines. Relative lengths 1, 4, 2, 3.

Palpi moderately long, similar in colour to legs, clothed with long, coarse yellowish hairs.

Falces slightly divergent, strong, pale yellowish, clothed with pale yellowish hairs, longest on the inner margins, arched in front; a row of three black teeth on each margin of each falx; fangs long, strong, dark brown.

Maxillæ pale yellowish, long, arched in front, clothed with long, coarse, pale yellowish hairs.

Labium pale yellowish, shiny, half as long as maxillæ, broad, rounded off at apex, a few long yellowish hairs, a thick fringe of long hairs at under side of apex.

Sternum shield-shaped, pale yellowish, thickly clothed with long yellow hairs.

Abdomen oblong, ovate, moderately convex, slightly projected over base of cephalothorax; superior surface, sides and inferior surface pale yellowish, thickly clothed with long, coarse, yellow hairs.

Epigyne a curved transverse slit, the curvature directed forwards.

Hab.—The shores of Port Jackson.

[redacted]

Eyes arranged in three groups; central pair dark, shiny, seated on a slightly raised dark brown eminence, and separated from each other by a space equal to once their individual diameter; lateral eyes in groups of three, each group forming a triangular figure the front lateral eyes are sensibly the largest of the eight, the inner eyes of the triangular figures are the smallest of the group and are of an opaline tint with black rings.

Legs long, strong, shiny, dark brown, almost black, furnished with rather long, fine black hairs, and few short stout spines Relative lengths 1, 2, 4, 3

Palpi long, strong, similar in colour to legs, and furnished with long black hairs fifth joint much the strongest, copulatory organs tinged with red, directed backwards, spiral at base, tapering, and terminating with a long strong spine, the spine directed outwards in a horizontal position

Falces long, strong, bright red, strongly arched, divergent at apex, where they are furnished with long coarse black hairs; fangs long, shiny, reddish brown

Maxillæ red, long, broad at base, tapering outwards to a point, arched in front, inner margins clothed with long coarse black and white hairs or bristles

Labium red, strongly arched, longer than broad, conical, fringed with black hairs at apex

Sternum somewhat elliptical, red in front, darker laterally; dark brown, with reddish brown lateral indentations towards junction with abdomen; a deep indentation in front under labium.

Abdomen triangular, slightly projecting over base of cephalothorax, broadest at posterior extremity, dark brown, nearly black, thickly clothed with long coarse hairs, a long, rather deep indentation runs down the abdomen from near its anterior to the posterior extremity, where it is slightly indented; sides and inferior surface similar to superior.

Hab Menindie, N S.W.

This species is the first of its genus recorded from Australia, and is consequently of more than ordinary interest. The spider was captured by Mr. A. G Little, Railway Surveyor, Menindie. I

am indebted to Mr. Henry Deane, M.A., for the privilege of describing this species.

Of the eight species described in the present paper, five of them (*Epeïra ficta*, *E. similaris*, *E. wagneri*, *Dolomedes neptunus*, and *D. spinipes*) are especially interesting from the fact that they, in common with hosts of other animals, are protected from the raids of predatory foes either by colouration or mimicry. Rambling along our sea-beaches certain small spiders are occasionally found lurking amidst the masses of small and broken shells denoting high water mark, and corresponding so accurately in colour to the sea-wrack referred to, that it is utterly impossible to detect them unless they are in motion; and not only is this so, but their habit of feigning death, upon the approach of what they suspect to be danger, adds greatly to the deception. Of these, *Dolomedes neptunus* and *D. spinipes* are instances in point.

One day last summer, while helping my boys to gather some shells at Taylor Bay, Port Jackson, I discovered one of the spiders referred to (*D. neptunus*). In endeavouring to catch it, it eluded me in the manner described, and so successfully that it was only by probing the shells and pebbles until my forceps touched "something soft" that I succeeded in making my capture. Throughout the entire range of natural history there is [redacted]

ᴅeᴀnᴏᴋyan, among which there are examples, not only ...ed like withered leaves, but some are green and marked ...mock-holes (as in *Epeira ficta*), and others with discoloured ...es on their surface, having the appearance of leaves attacked ...me insect (as in *E. similaris**). Quite a host of examples, ...of spiders and beetles, whose colouration is protective, may ...tained by shaking a branch of any shrub over an inverted, ...umbrella. Among the species whose haunts are confined to ...round, and those that ramble among rocks, the same rule ...s, the former harmonising with the colour of the soil, while ...atter reflect not only the various tints of the rocks, but ...ently mimick the lichens growing upon them.

... C. M. Weed says that the Ash-Grey Harvest Spider, ...*gium cinereum*, Weed, "is pre-eminently what may be called ...door species. It abounds especially in sheds, out-houses, ...neglected board piles, being rarely found . . . in the ...field. Its colour especially fits it for crawling over weather-...n boards, making it inconspicuous against such a background. ...g the day it is usually quiet, but at dusk and on cloudy ... it moves about quite rapidly."†

...verned by the law of natural selection, the tints of animals ...ently undergo certain modifications in order to suit them to ...d conditions of surroundings‡. In tracts of bush that have ... visited by fire, we find specimens so closely resembling the

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*Writing upon the subject of his observations at Pera, Mr. H. W. ... observes :—"The number of spiders ornamented with showy colours

charred branches or bark that when motionless it is utterly impossible to perceive them.* In some species the modification is very gradual, while in others the change is more rapid. An American author, Mr. J. Angas† states that when he placed a white variety of what he terms the "little flower spider" on a sun-flower it became quite yellow in from two to three days.

The habit of lying motionless when alarmed is common among sedentary spiders, such as the *Epeïridæ* and *Theridiidæ;* but it is badly developed in some and entirely absent in others of the jumping and swift-running species. Among the orb weavers the *Gasteracanthidæ* are singularly and effectively protected against the raids of insectivorous birds. Resting in the centre of their orbitular snares, fully exposed, the need of a protective armature is obvious, and this is afforded by their hard, horny and spiny abdomens. Likewise, the spines of *Acrosoma*, rendering the spiders similar in appearance to thorny leaves, knots of shrubs, acacias, &c., are also protective, and make these animals decidedly objectionable to insectivorous birds and reptiles. As in the case of the *Gasteracanthidæ*, the spiders of the genus *Acrosoma* also construct their webs in exposed situations, and sit fearlessly in the centre of the snares as though conscious of their security from attack.

In many instances specimens, when viewed in the cabinet,

ing attenuated bodies of the *Tetragnatha*, of which *T.* ...ea, Koch, and *T. lupata*, Koch, each found in the vicinity ...ney, are admirably adapted for concealment. These ...when alarmed seek refuge upon the stems or branchlets of ...and so closely do their tints agree with their surround... ...at detection is exceedingly difficult. *Epeira higginsii*, ...d and figured by Koch, and recorded by that eminent ...from Darling Downs, but whose range extends far south ...ey, is a singularly interesting example as far as its ...concerned, but in addition to that, its colouration and ...of mimicry are admirably adapted as a shield and protec... When disturbed it runs out of its snare to one of the ...ing lines or guys, and there remains suspended, with its ...bled up, the exact imitation, both in form and colour, of ...mn leaf. Writing to me upon the subject of protective ...tion in spiders, my esteemed correspondent and contem... H. R. Hogg, Esq., M.A., of Cheniston, Upper Macedon, ..., says: "With regard to the protective colouring of ... I have frequently been asked if they have not sometimes ...er of changing colour like chameleons in accordance with ...roundings. I must confess that all I have seen tends to ...actly the opposite, and that while many, if not most, are ...their earlier stages, they get darker as they grow older. ...especially noticeable in laterigrades. The colouring matter ...rs, both in skins and hairs, is of a particularly lasting ..., and even in spirits takes a long time to fade,* so that

Not only do spiders, in addition to colouration, possess th
of mimicry as a protection against birds, reptiles, &c., b
cocoons in some instances are also protected. The co
Epeïra herione, Koch, is made of withered leaves close
together, and suspended to one of the supporting lines
above the orbitular portions of the mesh, and looks more li
coloured mass of rubbish rather than a nest containi
Writing "On the History and Habits of the *Epeïra*
Spider,"* Mr. Frederick Pollock remarks:—"The favouri
of *E. aurelia* is the prickly pear—a plant from which th
can scarcely be distinguished in colour, and so clos
resemblance that the first time I saw one of these c
could hardly believe that it was not a withered piec
cactus." Anton Stecker also records a case of protectiv
blance in the nest of an *Epeïra* at Sokna (Tripoli),† cove
débris and the elytra of beetles, &c., and Odewahn ‡ obt
Gawler (South Australia) some globular spiders' cocoon
on branches of trees, and resembling the fruit of *Leptos*
the spiders of which were hanging near them, and resem
excrement of some bird in appearance, a wonderful
mimicry to which I shall presently have occasion to refer

In *Cyrtarachne caliginosa*, recently described and fig
me,§ we have, indeed, an extraordinary form. It is wel
that hairy caterpillars are exceedingly distasteful to bi

the cephalothorax, abdomen and legs of this remarkable spider have a like deterring effect upon predatory birds—that they form, in other words, a coat of safety. Mr. G. F. Atkinson has drawn attention to an American form of *Cyrtarachne** that mimicks a snail shell, the inhabitants of which are exceedingly common during the summer and autumn. The abdomen of the spider overhangs the cephalothorax, is broad at the base—broader, in fact, than the length of the spider, and rounded off at the apex. When resting upon the underside of a leaf, with its legs retracted, it strongly resembled one of the snail shells by the colour and shape of its abdomen. Two specimens collected by Mr. Atkinson deceived him at first, but a few threads of silk led him to make an examination. The spider seemed so confident of its protection, that it would not move when he jarred the plant, and only displayed signs of movement when transferred to the cyanide bottle. Some cocoons of *C. multilineata* were also described that strongly resembled insect galls. *Epeïra wagneri* is a common spider in the bush around Sydney. It is brightly coloured with green and yellow—colours admirably adapted for concealment when it drops out of the web, and seeks shelter among the coarse herbage, which it will do when alarmed. It is chiefly interesting, however, on account of its web and leaf nest. The web is placed low down, and in shape does not form a complete orb. The main supporting lines from which the mesh depends, are stretched horizontally and obliquely, and from the centre of these the radii and spirals are directed. The irregular lines at the upper part of the structure somewhat resemble the architecture of the typical *Theridiidæ*. The leaf-nest is placed at the base from which the radii start, and in this, during the period of mating, both sexes dwell, but at other periods the female is the only tenant. The leaf most commonly used is that of a Eucalypt, which is worked into the desired shape according to the leaf used; thus, for instance, a narrow leaf is rolled spirally, and a broader one is doubled over, the edges being tightly bound down with silk. In

* American Naturalist, xxii. pp. 545-546.

one side of the web; it consists of a Eucalypt leaf doub so that the tip and base nearly meet. The eggs are d inside the folded leaf, and then it is sealed up firmly and the female mounting guard during the period of incubati Waterfall and Fairfield, I have met with another sp *Epeïra* (at present undetermined) that constructs a m makes a leaf-nest like the one just described.

Among the *Thomisidæ* there are some interesting exa protective colouration and mimicry. Two spiders foun the vicinity of Sydney, but whose range extends both northern and southern colonies, namely *Celænia excavat* and *Thlaosoma dubium*, Cambr., mimick the excreta of b

When awaiting their prey these spiders lie on their ba in this position their appearance suggests that of a bird's d the denser part of the body on the underside being of a colour, spotted and streaked with dark markings; then, legs, owing to their colour and being closely pressed up to t add greatly to the deception. In addition to all this a lit silk is spun over a portion of the surface of a leaf, in the which the spider lies; this completes the deception as it r the more liquid portions of the fæces running off the l thickening at the edge as it trickles over. The deceptio as complete as could well be imagined. No one looking one or the other of these spiders in the situation describ ever imagine, unless previously aware of the fact, that ar

specimen that had been forwarded to the Australian Museum from Cavendish, in the Western District of Victoria, it was a female, and was mounting guard over exactly one dozen egg bags. These cocoons are spherical, uniform in size, somewhat brittle, and in appearance resemble the kernels of the Quandong (*Fusanus acuminatus*). Mr. H. O. Forbes, F.R.G.S.,* discovered a like case of mimicry in Java, but his book is so well known that it would be superfluous here to recapitulate the facts as communicated by him. It need only be noted, therefore, that the species discovered by him formed the type of a new genus, *Ornithoscatoides*, Camb. Mr. G. F. Atkinson also notes a case of mimicry† by a small spider of this family—*Thomisus aleatorius*, Hentz. This species is very common on grass, to the summit of the culms of which it climbs, where clinging with its posterior legs to the stem and its anterior legs on each side approximated and extended outwards, it thus forms an angle with the stem strikingly similar to that formed by the spikelets. The genus *Stephanopis*, Cambridge, is another group of remarkable spiders. By the form and arrangements of their legs, which are laterigrade, they can move forwards, backwards, or in a lateral direction, with facility. They are generally found lurking under loose bark, or among the rugosities of trees. Their colour and rugged appearance closely resembling bark not only shield them from the raids of enemies, but aid them in the capture of prey which they take either by stealth or pursuit. The colouration and ornamentation of the genus *Cymbacha* are also protective. These spiders also have laterigrade ambulatory limbs. They are found in similar localities to the *Stephanopis*. *C. festiva* and *C. simplex* are found both in Queensland and New South Wales, and each has been found in the vicinity of Sydney. While upon the *Laterigradæ*, I must not omit to mention those of the genus *Voconia*, Thor. These huge uncanny spiders are common enough

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* A Naturalist's Wanderings in the Eastern Archipelago, pp. 63-65, and figure.

† American Naturalist, xxii. pp. 545, 546.

in the bush around Sydney, as well as in the interior. If a piece of loose bark be stripped off the trunk of a tree, or from a decaying log, several of them may be seen scampering off with great rapidity. Representatives of this and allied genera are also to be found lurking under stones. These spiders have large, flat, hairy bodies, and remarkably long legs, and so are well adapted to the situations in which they are found, while their general dull colour harmonises to a nicety with their surroundings. Although the superior surface of the abdomen of some of these spiders is ornamented to a certain degree, their appearance nevertheless is hardly such as could be expected to inspire confidence. Bushmen have a deep-seated horror of them, and state that the results of their bite is not only painful, but exceedingly dangerous. *V. immanis*, *V. dolosa*, and *V. insignis*, each of which is described and figured by Koch in his admirable work, "Die Arachniden des Australiens," are to be found in the bush, not only in the vicinity of Sydney, but also at Brisbane and Rockhampton. In a small collection forwarded to me by Dr. Roth, from Winton, Central Queensland, there were specimens of *V. immanis* and *V. dolosa*, which, he informs me, he captured in his house.

The obnoxious odours and flavours of some insects, as in those butterflies of the *Heliconii* and *Danaidæ*, render them safe from [redacted]

ants. Bertkau* has recorded the fact from Prussian-
and Westphalia, Walsh,† from Bengal, Bates,‡ and
from the United States, Belt, from Nicaragua;
ale,¶ from Africa, Rothney,** from Barrackpur, besides
ers. The ants that are chiefly mimicked by spiders are
live on trees or shrubs. Owing to their powers of
acrid secretions which they can eject to a considerable
an approaching enemy, the obnoxious odours emitted,
ing in communities and fighting battles in a united
the common good, they are admirably protected from
small animals that prey upon insects. This being so,
rs that mimick them and wander about their haunts
an almost absolute immunity from dangers that beset
nderers. The *Attidæ* do not spin webs for the capture
t take their victims by stealth, stalking them, and
pon them from behind. So great is the resemblance
tidæ to the ants that experienced collectors viewing
alive are frequently deceived.†† Not only does the
monise with that of the insect mimicked, but the

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hnahnlichkeit unter Spinnen, &c. Verhand. des naturhist. Preussischen Rheinlande and Westfalens Bonn, Abh. (1886). Bertkau also notes in the same paper that certain *Drassidæ*, more particularly the genera *Phrurolithus* and *Micaria*, *Thomisidæ* and *Epeiridæ*, he observes this kind of mimicry is t the *Theridiidæ* furnish a beautiful example in *Formicina* On elms infested by *Lasius* and *Formica* a species of *Lasiola* male of which alone resembles ants

al of the Asiatic Society of Bengal, 1891, No. 1, pp. 1-4

‡ Trans. Linn. Soc. Vol. xxiii.

pers of the Nat. Hist. Soc. Wisconsin 1892, pp. 1-83.

"Naturalist in Nicaragua," p. 314.

¶ "Nature," Vol. iii. p. 508.

Journal of the Bombay Nat. Hist. Soc. Vol. v. p. 44.

W. Froggatt informs me that a small black *Chalcid* on the at Mosman's Bay mimicks a small jumping spider, and was as a spider.

contour of the body and the manner of carrying the first pair of legs, so as to appear like antennæ, and which, ant-like, they keep in motion when running about, make the deception complete. All observers, whose works I have consulted, with the exception of Dr. E. G Peckham, are unanimous in their testimony as to the manner in which these ant-mimicking *Attidæ* carry the first pair of legs Of those species I have observed mimicking ants each carried the first pair of legs in imitation of antennæ. But Dr. Peckham says that an American species *(Synageles picata)* "holds up its second pair of legs to represent antennæ." Tull Walsh considers that this peculiarity of habit may be accounted for by a difference in the relative lengths of the legs, although another American species *(Synemosyna formica)* observed by Peckham* to use its second pair of legs in imitation of antennæ has the usual formula of legs—4, 1, 3, 2.

Tull Walsh in an interesting paper† says:—"I have noticed that the spiders are probably protected from birds and other enemies by their resemblance to ants, but there can be no doubt that frequently they also thereby gain another very considerable advantage. The ants with which these spiders most do congregate are fairly omnivorous feeders, but show a decided preference for sweet juices often to be found exuding from trees, fruit, or flowers. To these juices come also flies, small beetles and other

[redacted]

and, although I have watched closely on numerous s. I never yet saw an ant attacked by a spider. Indeed, tural ferocity, hardness of body, and faculty of combining stand assault, would tend to show that spiders were more o be attacked by ants than that the ants would be d by spiders. This view was held by Mr. Belt, who d:—"The use that the deceptive resemblance is to them n explained to be the facility it affords them for approach- on which they prey. I am convinced that this explanation rect so far as the Central American species are concerned. and especially the stinging species, are, so far as my nce goes, not preyed upon by any other insects. No need be adopted to approach them, as they are so bold ey are more likely to attack a spider than a spider them.

Their real use is, I doubt not, the protection the disguise against insectivorous birds. I have found the crops of umming birds full of small soft-bodied spiders, and many irds feed on them. Stinging ants, like bees and wasps, ely resembled by a host of other insects; indeed, whenever any insect provided with any special means of defence, I for imitative forms, and was never disappointed in finding " Among the Australian *Attidæ* that mimick ants are *myna lupata*, Koch, recorded from Port Mackay, *Leptor- striatipes*, Koch, and *L. cognatus*, Koch. These two latter occur in the vicinity of Sydney. I have in my possession,

at Thornleigh. Both spider and fly were equal in size, small, and brightly coloured, the thorax bright red, and the abdomen bright green; the tips of the tarsi of the spider were white like the tips of the wings of the fly, and each were found on the bracken (*Pteris aquilina*, var. *esculenta*). When in want of a meal the spider throws up two legs on each side of its body, loops them together by hooking the tarsi, and beats the air vigorously, the result being that the light striking through the loops gives the appearance of a pair of bright transparent wings in rapid motion, and the fly, evidently convinced that it is one of its friends, alights, only to fall a victim to a remorseless enemy. Mr. Skuse also informed me that the spider in question is capable of jumping a considerable distance—not less than six inches, and that when in the air it has the appearance as if flying.*

Summary.—Now it has been abundantly proved by Poulton, Beddard, Wallace, Darwin, and others, that colouration and mimicry in animals play an important and essential part either for *protection* against natural enemies, as a *warning* to others, or *attraction* for prey; and the more they are studied, and their life histories investigated, the more clearly do we understand why the tints of some animals are so bright and glaring, and others so dull and sombre. After much patient work and investigation, and the collection of a vast array of facts such as I have enumerated, but which included observations from a far wider

ments.—5.—Attractive colours.

For the purposes of this paper it will suffice to divide the *Araneidæ* into two groups, namely:—

1.—(*a*) Protective colouration, and (*b*) formation.

2.—Spiders that mimick (*a*) animate and (*b*) inanimate objects, and (*c*) whose colours are attractive.

Protective Colouration and Formation.—In the course of my remarks, I have drawn attention to the fact that certain spiders are protected by the uniformity of their colouration to surrounding objects. Thus we have seen that while the colour of one spider harmonises with that of the small and broken shells on our sea-beaches, another group (*Stephanopis*) finds shelter by its close resemblance to the bark of trees, then again, there are others whose physical formation is protective, and of such are the genera included in the subfamily of *Gasteracanthidæ*, whose hard, horny, and generally spiny epidermis make them anything but tempting morsels for insectivorous birds.

Spiders that mimick animate and inanimate objects, and whose colours are attractive. This group contains those spiders whose protection is secured, or who capture their prey by the mimicry of animate and inanimate objects, and in this class we have the extraordinary case of mimicry reported by Mr. Skuse, in which, by the elevation of one pair of legs on each side of its body, keeping them together by the tarsi, and beating them rapidly up and down, a certain species of spider, in addition to its colouration, adds that of the mimicry of a pair of wings, and thus secures as prey a certain dipterous insect. Again, there is the no less wonderful mimicry by certain spiders, even to the most minute detail, of birds droppings—a form of mimicry that not only secures them from the raids of their common enemies, but also attracts those insects upon which they prey.

Conclusion.—Taken collectively, these facts add an important link to the great chain of evidence upon which the law of natural selection is based and built. Much more might be added, but sufficient has been given to illustrate the great truths comprised in that law. I am indebted to my colleague, Mr. Edgar R. Waite, for the admirable coloured drawing of *Actinopus formosus*, which has been reproduced in Plate XX.

EXPLANATION OF PLATES.

Plate xviii.

Fig. 1. —*Nephila ornata* ♀.
Fig. 1*a*.— „ „ abdomen in profile.
Fig. 1*b*.— „ „ Epigyne.
Fig. 2. —*Epeira ficta* ♀.
Fig. 2*a*.— „ „ Epigyne.
Fig. 3. — „ *similaris* ♀.
Fig. 4. —*Dolomedes neptunus* ♀.
Fig. 4*a*.— „ „ eyes.
Fig. 5. — „ *spinipes* ♀.

Plate xix.

Fig. 1. —*Nephila picta* ♀.
Fig. 2. —*Epeira wagneri* ♀.
Fig. 2*a*.— „ „ Folded eucalypt leaf nest } E
Fig. 2*b*. — „ „ Rolled eucalypt leaf nest } f
Fig. 2*c*.— „ „ Folded leaf (*Lantana camara*) nest } nes
Fig. 2*d*.— „ „ Leaf of a eucalypt folded over to form co

Plate xx.

Fig. *Actinopus formosus* ♂ (×3).

A NEW GENUS AND THREE NEW SPECIES OF MOLLUSCA FROM NEW SOUTH WALES, NEW HEBRIDES, AND WESTERN AUSTRALIA.

By John Brazier, F.L.S., C.M.Z.S., etc.

*Clathurella (?) Waterhouseæ, n.sp.

Shell fusiformly turreted, moderately solid, yellowish white, with a zone of double blackish brown nodes or spots on the last whorl, similar blackish markings being occasionally apparent here and there on the base and upper portion of the whorls; whorls 9, the three apical quite smooth, the others slightly convex, longitudinally ribbed and crossed with transverse spiral striæ, becoming sharply and prominently nodulous upon the ribs; spire sharp, apex light brown; aperture ovate, columella somewhat straight, white, canal short, outer lip more or less broken, barely showing any posterior sinus.

Long. 13; diam. 4½; length of aperture 5 mm.

Hab.—North Head of Botany Bay, New South Wales (*Mrs. G. J. Waterhouse*).

I place this pretty little species provisionally in *Clathurella* as the outer lip is broken, showing a very small sinus; the centre of the last whorl with two rows of black nodes on the ribs terminating on the second whorl above the suture; three similar rows on the base but not so clear and distinct, large blackish brown spots below the suture; the remaining whorls with a single row of blackish brown nodes above the suture with the spots here and there below. This interesting species was found by Mrs. G. J. Waterhouse and her sons on June 11, 1896, under a large stone at Botany North Head; the specimen was in the possession of a

*This species must now be referred to *Canthurus*. A perfect adult specimen from Port Jackson, west side of Vaucluse, recently found by my son and myself, has the outer lip crenulated, thickened externally and denticulated within. Long. 15; diam. 5½; length of aperture 6 mm.—25 xi. 96.

hermit crab; the suture of the third whorl has been perforated by a *Nassa* or *Natica*.

Type in the Waterhouse Collection.

CONUS KENYONÆ, n.sp.

Shell solid, oblong, coronated; spire very little raised, apex obtuse, whorls 6, with white nodes, the interspaces with yellowish brown spots, spirally sulcated at the lower part with 7 rather narrow grooves, the upper being the finest; colour cream yellow with snow white flexuous streaks and blotches in the centre; columellar base dark brown, ornamented with snow-flake spots; lip straight, somewhat thickened, interior of the aperture white.

Long. 43; diam. maj. 24; aperture 39 mm.

Hab.—Shark's Bay, W.A. (*Mr. Podesta*).

The unique specimen of this new cone is slightly sea-worn but quite distinct from any of the species known to me. The upper half of the shell is quite smooth, the lower part having 6 or 7 rather narrow spiral grooves, and the centre ornamented with snow white flexuous streaks and blotches.

I have seen a second specimen formerly for many years in the collection of the late Mrs. Brazier, which differs very much, both in colour and markings. I define it under a new varietal name.

CONUS KENYONÆ var. ARROWSMITHENSIS, var.nov.

[redacted]

curved shelly plates numbering about forty-four, giving the edge of the shoulder the appearance of being coronated with triangular pointed nodes; outer lip sinuous, forming an oblique posterior deep narrow sinus.

This is connected with *Conus* and *Pleurotoma* and may be placed under the former genus for the present until the animal is known.

KENYONIA PULCHERRIMA, n.sp.

Shell subcylindrical, rather thin, smooth, sometimes marked with faint slightly curved longitudinal lines of growth; whorls 8, tabled at the suture, each one being connected with small curious shelly plates that look like small deep pits when the shell is looked at end-on from the apex, giving the edge of the shoulder a coronated appearance, with triangular pointed nodes; last whorl more than half the length of the whole shell, ornamented with longitudinal reddish brown streaks and blotches, some of a zig-zag pattern, the three upper or apical flesh colour, smooth; outer lip sinuous, having an oblique posterior deep narrow sinus; columella straight; interior of aperture white.

Long. 28, last whorl 17, the others 12; diam. maj. 10 mm.

Hab.—New Hebrides (*A. F. Kenyon*).

This very pretty shell Mrs. Kenyon showed me some three years ago when in Sydney; she now writes (19/5/96):—"The curious shell I now send I used to think was a Cone. I do not think any more have been or are likely to be found. I got it from a man who with his family had been over ten years resident in Fiji and the New Hebrides. The natives used to collect and bring him shells. There were some hurricanes during their residence, after which they used to pick up shells. I have had it in my possession about three years."

The shell being thin, I should take it to be a deep water species. The very curious little curved shelly plates at the suture make it coronated with small triangular shaped nodes; in places the suture is canaliculated and small rough shelly plates stand up somewhat like a minute roadway.

Mr. Baker contributed the following Note on a new variety of *Acacia decurrens*, Willd., a flowering specimen of which was exhibited :—*A. decurrens*, var. *Deanei*, a shrub, from 3 to 5 ft., hoary, pubescent, the extremities of the branches silvery white; branches and branchlets terete, occasionally slightly ribbed by faint decurrent lines from the base of the branchlets. Pinnæ 6 to 12 pairs, leaflets 15 to 25 pairs, oblong, obtuse, 1 to 2 lines long, 1-nerved, minutely pubescent. Glands regularly occurring along the rachis, one under each pair of pinnæ. Flower-heads small, few, in axillary racemes or forming a loose terminal panicle. Flowers not numerous, about 20 in a head, small, 5-merous. Calyx turbinate, broadly lobed Petals minutely pubescent. Pod about 4 inches long and 3 lines broad, much contracted between the seeds. Seeds oblong, arillus club-shaped, gradually tapering off into a short, straight funicle.

Hab.—Gilgandra, N.S.W. (Mr. Henry Deane).

This variety differs from the *A. decurrens* var. *normalis*, of Bentham, (1) in *not* having the strongly decurrent lines of that variety, in fact, the branches and branchlets are all but terete, and in that respect resemble *A. decurrens* var. *mollis*, (2) in having shorter and broader leaflets; and (3) in the narrower pod It resembles this variety in having only one

Mr Edgar R. Waite exhibited a female Pouched Mouse and her eight young ones, *Phascologale flavipes*, Waterhouse; and contributed the following note on the nidification of this species:—So little has been recorded of the breeding habits of the pouched mice that the following extract from my note book dated November 23rd, 1893, and referring to the examples now exhibited, may be of interest. The mice were captured at Berowra Creek, an arm of the River Hawkesbury. Clambering up a rocky slope, I noticed that one of the weathered holes so common in the sandstone boulders of the district, was choked with dry leaves. The hole was in a vertical face of the boulder about four feet from the ground, and as the leaves, all of Eucalypts, were regularly placed in a compact mass, I began to poke them out. When a hat full had been removed a rustling was heard within, and further leaves were cautiously withdrawn. A little nose and a pair of sparkling eyes appeared for a moment, and while removing more leaves, of which there seemed to be no end, the owner rushed out and was climbing up the perpendicular face of the rock when secured. It was a half grown *Phascologale flavipes*, and as the hole was evidently not merely a retreat but probably contained an actual nest, I continued to remove the leaves. Scutterings within indicated that the occupants were of some number. The nest was finally reached and contained two young ones the size of the one first caught. It was composed entirely of Eucalypt leaves and was completely domed over, but fell to pieces when handled, as the leaves were not secured together in any way. A larger, and evidently the mother mouse, came to the opening for an instant unaccompanied; almost immediately she reappeared and left the hole, this time with some young ones clinging to her back. Although thus heavily weighted she nearly escaped me. She ran under a horizontal ledge of rock and clung like a fly, back downwards. When captured it was found that she had four young ones clinging to her, which together must have equalled more than her own weight. On removing the mouselings it was seen that each had a tuft of hair in its mouth, showing how they had retained their hold. I

now had the mother and seven young ones and on feeling i hole, which received my arm nearly to the elbow, I secur eighth. The everted pouch exposed eight teats, so that mother had her complement of young.

Although constantly stated that no true pouch exists in me of the *Phascologale*, this is scarcely correct. When very youn offspring are completely hidden by the outer wall of the closing over them. As they increase in size the mouth dilate no longer conceals the young. Mr. Oldfield Thomas* does not Krefft's statement that this species is provided with 10 t Although 8 is the usual number, I have examined several fe with 10 teats, and there is one preserved in the Aust Museum with not only 12 teats, but also a young one on teat. As far as can be judged without spoiling the exhibit animal does not otherwise differ from typical examples. It therefore appear that in the *Dasyuridæ*, or at least in *Phascol* the number of mammæ is not such a constant character a been insisted upon, or three otherwise similar species would to be admitted; characterised by the possession of 8, 10, ar mammæ respectively.‡

Mr. Rainbow showed the spiders described in his paper, drawings of the same

345] from the North Head of Botany Bay, a new Cone West Australia, and a remarkable Shell from the New des for which a new genus is proposed.

President exhibited three albums of mounted specimens of rn Australian wild flowers.

WEDNESDAY, AUGUST 26th, 1896.

The Ordinary Monthly Meeting of the Society was hel
Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesd
ing, August 26th, 1896.

P. N. Trebeck, Esq., J.P., in the Chair.

Mr. George William Card, A.R.S.M., A.R.C.S., Cur
Mineralogist, Geological Survey of New South Wales;
fessor Richard Threlfall, M.A., Sydney University, wer
Members of the Society.

DONATIONS.

University of Melbourne Examination Papers—Final

[redacted]

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Royal Dublin Society - Transactions (Series ii.) Vol. v. Pa 5-12 (Aug., 1894-Jan., 1896): Vol. vi. Part 1 (Feb., 189 Proceedings. (N.S.) Vol. viii. Parts 3-4 (Aug., 1894-Sept., 189 *From the Society.*

ON THE AUSTRALIAN *BEMBIDIIDES* REFERABLE TO THE GENUS *TACHYS*, WITH THE DESCRIPTION OF A NEW ALLIED GENUS *PYRROTACHYS*.

BY THOMAS G. SLOANE.

In the present paper I have placed in the genus *Tachys* all the Australian Bembidiides which have the anterior tibiæ decidedly oblique above the apex on the external side; normally also a striole is present on the apical declivity of each elytron, but this character is not invariable.

The most important contribution to the knowledge of the Bembidiides of Australia is Sir William Macleay's notice and descriptions of seventeen species from Gayndah, all of which he referred to the genus *Bembidium.** I have seen the types of Macleay's species in the Australian Museum, Sydney. Three of them, viz., *B. amplipenne*, *B. bipartitum* and *B. sexstriatum*, I am unable to deal with, as I do not possess specimens; and, not residing in Sydney, I cannot see the types at present. Specimens of the eleven species to which the remaining fourteen must be reduced are in my possession. Nine are dealt with in the present paper; the tenth is *Bembidium jacksoniense*, Guér., = *B. subviride*, Macl., the eleventh, *Bembidium gagatinum*, Macl., is not a Bembidiid at all, but a Harpalid which may be referred, at least tentatively, to the genus *Thenarotes.*†

* *Vide* Trans. Ent. Soc. N.S.W. 1873, ii. pp. 115-120.

† *Bembidium flavipes*, Macl., is a synonym of *B. gagatinum*, Macl., being founded on an immature specimen; the species, which extends as far south as the Murray River, may be known in future as *Thenarotes gagatinus*, Macl.

The principal features used in the synoptic table of species which follows seem to divide the species here placed in *Tachys* into distinctive groups that are readily separated from one another; indeed the most important of these groups are apparently so distinct that they might be removed from *Tachys* altogether and formed into separate genera; but to do this would require a fuller knowledge than I possess of the genera now regarded as capable of maintenance among the Subulipalpi, and of the system adopted in classifying them. The minor features used in the table for separating closely allied species from one another are not perhaps always the best that could have been chosen, though they have seemed to me to be so.

The following species of *Tachys*, described by the Rev. Thos. Blackburn, are unknown to me in nature, and, for that reason, have not been included in the table, viz., *T. baldiensis*, *T. infuscatus*, and *T. adelaidæ*.

Genus Tachys.

Owing to the variable number of striæ on the elytra among the species of the genus *Tachys* (the full number is eight striæ and a marginal channel, but this only occurs in *T. yarrensis*, Blkb., among the species known to me) the ordinal number to indicate the stria next the marginal channel would vary, and as this stria seems a feature of great classificatory importance it becomes needful to use an unvarying term for it. I therefore call it the *submarginal stria*. The interstice between the submarginal stria and the marginal channel I call the *lateral interstice*.

[redacted]

C Marginal channel of elytra simple, ateral interstice convex.

Prothorax without a dentiform projection on sides before base.

. Elytra sexstriate on each side of suture.

f. Elytra quadrimaculate, fifth stria reaching border of base .... *T. buprestioides*, Sl.

ff. Elytra bimaculate, fifth stria not reaching base.................. ...... *T. froggatti*, Sl.

ee. Elytra quinquestriate on each side of suture

g. Elytra quadrimaculate............. *T. striolatus*, Macl.

gg. Elytra bimaculate .... *T. bipustulatus*, Macl.

**eee*. Elytra bistriate on each side of suture.. .... *T. curticollis*, Sl.

eeee. Elytra unistriate on each side of suture .... *T. iaspideus*, Sl.

dd. Prothorax with a dentiform projection on sides a little before base.

h. Elytra bistriate on each side of suture............. .... *T. spenceri*, Sl.

hh. Elytra unistriate on each side of suture........... .... *T. bistriatus*, Macl.

CC. Marginal channel of elytra punctate, lateral interstice depressed.

i. Elytra with eight punctate striæ on each (seventh as well marked as others)............................. . ... *T. yarrensis*, Blkb.

ii. Elytra with seventh stria obsolete.

j. Lateral basal foveæ of prothorax concave, bordered by the widely upturned lateral border.

k. Elytra sexstriate on each side of suture, lateral margin of prothorax with one setigerous puncture anteriorly .... *T. monochrous*, Schaum.

T. *orensensis*, Blkb., (a specimen of which I received from Mr. Blackburn while this :r was in the press) belongs to section "*eee*." For some differences between it and *T icollis*, see description of the latter (*post*, p. 364).

kk. Elytra quinquestriate on each side of suture, margin of prothorax plurisetose near anterior angles.............. *T. seticoll*

jj. Lateral basal foveæ of prothorax concave, divided from lateral border by a raised space .... *T. flinder*

jjj. Posterior angles of prothorax forming the apex of a triangular marginal process.

l. Colour piceous red, elytra with testaceous ante-apical maculæ *T. semistr*

ll. Colour black ... . *T. habitat*

II. Elytra with submarginal stria obsolete on sides.

M. Form short, very convex; prothorax not perceptibly narrowed to base; elytra lævigate, unistriate on each side of suture ..... *T. ovatus,*

MM. Form varying, prothorax evidently narrowed to base.

N. Head impunctate, frontal impressions deep, oblique (converging anteriorly); third interstice of elytra bipunctate on disc.

o. Elytra with six rows of strong punctures on each side of suture. .. .. . *T. mitche*

oo Elytra with three or four punctulate

*s. Discoidal puncture of elytra placed a little before middle nearer suture than margin.

t. Elytra depressed, sides parallel; prothorax piceous black .... *T. uniformis*, Blkb.

tt Elytra lightly convex, sides rounded; prothorax testaceous.

u. Elytra with strongly impressed punctulate striæ on disc, base testaceous (a wide black fascia across middle of elytra)........... *T. atriceps*, Macl.

uu. Elytra with faintly impressed striæ on disc, middle of base piceous... *T. lindi*, Blkb.

ss. Discoidal puncture of elytra placed about anterior third, nearer margin than suture... *T. transversicollis*, Macl.

rr. Elytra lævigate, nonstriate, recurved striole of apex obsolete .... *T. macleayi*, Sl.

TACHYS BRUNNIPENNIS, Macleay.

T. (Bembidium) brunnipennis, Macl., presents the characteristic itures of *Tachys*, viz., the anterior tibiæ oblique above apex on ernal side, and the elytra with the sutural stria recurved at x; the recurved apical striole is very near the margin, and is ded from the submarginal stria by a narrow subcarinate rstice.

ab.: Queensland—Cairns (Froggatt), Port Denison and ıdah (Masters).

TACHYS ECTROMIOIDES, n.sp.

al, subdepressed. Prothorax transverse, much wider at base apex, posterior angles rectangular: elytra oval, lightly

imilis, Blkb., (a specimen of which was received from Mr. Blackburn too late to be into the table) comes into section "*s*." It resembles *T. uniformis*, Blkb., in facies, fers in colour.

convex, finely striate; third stria more strongly impressed on apical declivity and joining sutural stria at apex; submarginal stria faintly impressed, very near margin. Head dark piceous, labrum testaceous; prothorax piceous brown, lateral margin and middle of base testaceous; elytra testaceous, a very wide dark piceous fascia across disc considerably behind base, apex widely piceous; legs testaceous, antennæ infuscate, basal joints testaceous.

Head depressed, hardly impressed laterally, a feeble oblique ridge on each side near eyes; clypeal suture finely impressed; clypeus bifoveolate; eyes large, convex. Antennæ filiform, not long. Prothorax transverse (0·65 × 0·85 mm.), widest about anterior third, roundly declivous to lateral margin anteriorly; sides strongly rounded to apex, straight posteriorly and hardly narrowed to base; anterior margin truncate; anterior angles not marked; basal angles rectangular, acute; base lightly and roundly produced backwards in middle; lateral border reflexed, reaching to sides of head at apex; lateral channel wide, narrowed to anterior angles, median line deep, a strongly marked arcuate transverse line defining basal part of prothorax; a lightly carinate longitudinal submarginal ridge near each basal angle. Elytra oval, convex, much wider than prothorax (2 × 1·3 mm.); sides rounded; shoulders rounded; five inner striæ lightly impressed, finely crenulate, sixth and seventh obsolete; interstices depressed, first narrow on apical declivity, second and third ampliate on apical declivity, third with two small setigerous punctures—the anterior just before, the posterior just behind discoidal piceous fascia; lateral interstice very narrow, not convex, having four [redacted]

placed it with *T. brunnipennis*, Macl., in the table of species at p. ...; this has only been done on account of the submarginal carina near basal angle of prothorax, and not because I have thought there is any close affinity between these species. In general appearance it has a resemblance to a Lebiid of the genus *Sarothrocrepis* or *Ectroma*. If the ground colour of the elytra be considered piceous, then the base (widely), the margin and a narrow fascia just above the apical declivity would be described as testaceous; the dark-coloured parts of the elytra do not anywhere reach nearer the sides than the submarginal stria.

TACHYS BUPRESTIOIDES, n.sp.

Robust, oval, convex. Head wide; prothorax transverse, wider at base than apex; elytra ovate, six inner striæ strongly impressed on each elytron, lateral striæ and marginal channel strongly impressed, interstice between them convex. Bronzed black; each elytron with an elongate macula behind shoulder and a ...form macula on apical third testaceous; legs (excepting ...) testaceous; antennæ infuscate; under surface piceous, apical segments of abdomen reddish.

Head convex, finely shagreened, lightly bi-impressed; clypeal suture finely and distinctly marked; eyes large, convex, not ... Maxillary palpi with penultimate joint elongate, thick, ...vate, setose; apical joint very small. Prothorax transverse, widest at anterior marginal puncture; sides strongly rounded on anterior two-thirds, lightly narrowed posteriorly, straight before base; anterior margin emarginate; anterior angles obtuse but marked; basal angles rectangular; base truncate on each side, ...ently produced backwards in middle; border narrow, reflexed; median line very lightly impressed; a straight transverse line near base, this line strongly impressed in middle; lateral basal impressions short, placed at each side of rounded middle part of base. Elytra wider than prothorax, convex; sides rounded; shoulders rounded; striæ simple, only first reaching apex, first, second and fifth reaching base, second, third and fourth extending past posterior margin (between macula and suture) of ante-apical

macula, fifth and sixth not extending past anterior ma ante-apical macula, fifth reaching basal border, sixth not r base, seventh obsolete (only noticeable under a lens on bla of space between sixth and eighth); lateral stria deeply im curving towards margin posteriorly; inner interstices submarginal interstice very convex, bipunctate near base beginning of apical curve; lateral border extending on to far as fifth stria. Anterior tibiæ shortly oblique above external side; a short acute spur above obliquity.

Length 3·1, breadth 1·3 mm.

Hab.: King's Sound (Froggatt; Macleay Museum).

Allied to *T. striolatus*, Macl., but larger and broader; thorax is more transverse and wider across the base, less on the sides, the anterior angles more strongly marked; t humeral macula of the elytra is elongate; there are six (r striæ on each elytron, the first, second and fifth striæ reacl base. The whole of the dark part of the elytra, except sides, is strongly striate, the third and fourth striæ do n quite to the base, but there is not the wide lævigate bas that is so noticeable in *T. striolatus*.

TACHYS FROGGATTI, n.sp.

Robust, oval, convex. Head wide, lightly bi impress

Differs from *T. buprestioides* by its smaller size, by the absence of the post-humeral maculæ of the elytra, and by the fifth stria not reaching the base. It is closely allied to *T. bipustulatus*, Macl., from which it differs by having six (not five) striæ on each elytron and the striæ reaching nearer the base—especially the three inner ones.

TACHYS STRIOLATUS, Macleay.

T. (*Bembidium*) *striolatus*, Macl., has been redescribed and placed in *Tachys* by the Rev. Thos. Blackburn.*

Habits:—Riparian, running beside the margins of streams, or on sandy margins of pools, during summer months.

Hab.: Queensland—Gayndah (Masters); N.S. Wales—Narrandera and Mulwala (Sloane); Victoria—near Bright (Blackburn).

TACHYS BIPUSTULATUS, Macleay.

T. (*Bembidium*) *bipustulatus*, Macl., agrees in all points of structural detail and in striation of elytra with *T. striolatus*, Macl.

Habits:—Riparian; two specimens occurred to me on the muddy edge of pools in Houlaghan's Creek near Junee.

Hab.: Queensland—Gayndah (Masters); N.S. Wales—Forest Reefs (Lea), Junee District (Sloane).

TACHYS CURTICOLLIS, n.sp.

Oval, convex. Prothorax transverse, evidently a little wider across base than apex, posterior angles rectangular and acute; elytra lævigate on disc, bistriate on each side of suture, lightly bipunctate near second stria. Black, or piceous black; each elytron with a dull reddish spot near shoulder and another at beginning of apical declivity; legs pale testaceous.

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* *Vide* P.L.S.N.S.W. 1891 v. (2), p. 785, and Trans. Roy. Soc. S. Aust. 1894, xviii. p. 139.

Head smooth; frontal impressions long, straight, diverging backwards, extending forward to labrum; eyes prominent, hemispherical. Prothorax lævigate, convex, short, transverse, widest just behind anterior marginal puncture; basal part defined by a transverse impression, sides lightly rounded anteriorly, gently narrowed to base, meeting base at right angles; base sloping lightly forward on each side to posterior angles; lateral border reflexed, becoming wider towards base; median line obsolete; a flattened depressed space near each basal angle; a light transverse linear impression (hardly punctulate) connecting the lateral basal depressions. Elytra much wider than prothorax, oval, truncate at base (shoulders rounded), convex, declivous to base; striæ simple, first entire, second as strongly impressed as first, not reaching base or apical declivity, a deep lateral stria besides marginal channel on each elytron. Anterior tibiæ oblique above apex on external side, a spiniform spur above obliquity.

Length 2, breadth 1 mm.

Hab.: N.S. Wales—Tweed River (Lea; March, 1892), Cootamundra District (Sloane).

At a casual glance this species might be taken for a small form of *T. bistriatus*, Macl., but it differs decidedly from that species by having a second stria outside the sutural one extending from [redacted]

TACHYS IASPIDEUS, n.sp.

Elongate-oval; prothorax transverse (not short); elytra lævigate, each elytron unistriate near suture and with recurved stria of apex distinct. Shining, polished, reddish or reddish brown, elytra lighter coloured than prothorax near base, almost black across middle and near apex, a large yellowish-red spot behind posterior discoidal puncture on each elytron.

Head smooth, convex, lightly bi-impressed between eyes; the impressions short, not extending to clypeus; eyes large, convex. Prothorax small, transverse, a little wider than head, widest a little before middle, lightly narrowed to base, convex, lævigate, declivous to middle of base, not transversely impressed across base; sides lightly rounded, gently narrowed (not sinuate) to posterior angles; apex and base truncate, posterior angles obtuse, not prominent; border narrowly reflexed; median line wanting; a lightly marked wide oblique impression at each basal angle. Elytra much wider than prothorax, suboval, convex, a little depressed on disc; base subtruncate, humeral angles rounded, apex narrowly rounded; one simple stria on each side of suture, no deep lateral stria besides the marginal channel on each elytron; lateral interstice convex and depressed posteriorly; lateral margin interrupted just behind shoulders causing the margin of the humeral angles to project slightly; two punctures placed longitudinally on disc of each elytron.

Length 2·8, breadth 1·3 mm.

Hab. N.S.W.—Inverell, Tamworth (Lea).

This species exactly resembles *T. spenceri*, Sl., in shape and appearance; the marked features distinguishing it from that species are (a) the absence of any projection at the basal angles of the prothorax, and (b) the elytra having only one stria on each side of the suture, not two as in *T. spenceri*. The penultimate joint of the maxillary palpi is large and pyriform, the apical joint a mere short spike. The general colour is like that of polished yellowish brown jasper.

Tachys spenceri, Sloane.

Habits :—Found under stones besides edge of water (Spencer).

Hab.: Central Australia—Larapintine Region (Spencer); West Australia—King's Sound (Froggatt).

Tachys bistriatus, Macleay.

T. (Bembidium) bistriatus, Macl. (= *Bembidium convexum*, Macl.), has a short recurved striole on the middle of the apex of each elytron; the posterior angles of the prothorax form a small triangular prominence on the sides a little before the base itself. I have carefully compared the types of *Bembidium bistriatum*, Macl., and *B. convexum*, Macl., with one another and find them one species.

Hab.: Queensland—Gayndah (Masters); N.S. Wales—Tweed and Clarence Rivers (Lea).

Tachys yarrensis, Blackburn.

Habits :—Found under logs and débris in very damp situations.

Hab.: Victoria—Upper Yarra (French); N.S. Wales—Mulwala and Urana (Sloane), Tamworth (Lea).

Tachys monochrous, Schaum.

Colour. Clear ferruginous red, subtestaceous above apical declivity of elytra, legs testaceous, antennæ ferruginous, basal joint testaceous.

Head convex, front widely but rather deeply bi-impressed, eyes large, convex. Antennæ short, stout, filiform (reaching back a little behind base of prothorax). Prothorax broader than long, widest a little before anterior third, evidently narrower across base than apex, disc lightly convex, rather depressed in middle, lightly declivous to basal area, sides strongly rounded anteriorly, shortly, strongly and roundly narrowed to anterior angles, strongly sinuate posteriorly, meeting base at right angles, anterior margin truncate, anterior angles not marked, base widely truncate in middle, oblique on each side, basal angles prominent, acute; basal area depressed, well marked, extending to lateral border at each side, defined anteriorly by a strongly marked transverse punctate impression, lateral border very narrow on rounded part of sides, thick and strongly reflexed near basal angles, median line very lightly impressed on disc; four or five setigerous marginal punctures between anterior third and anterior angles. Elytra widely ovate, base roundly truncate, humeral angles not marked, sides rounded, first stria entire, punctate for more than half its length, simple posteriorly; striæ 2-5 consisting of rows of closely set strong punctures extending from base to lighter coloured elongate apical part of elytra; submarginal stria punctate; lateral interstice not convex, marginal channel closely punctate, the punctures from shoulder to apical curve each bearing a long seta.

Length 2·25, breadth 1 mm.

Hab. North West Australia: King's Sound (Froggatt; Macleay Museum).

Allied to *T. monochrous*, Schaum, but differing by its shorter, wider, and rather less convex form, the prothorax wider, more strongly narrowed to base, disc flatter and less strongly declivous to base, margin plurisetose behind anterior angles, elytra shorter, wider, less convex, five- (not six-) striate.

TACHYS FLINDERSI, Blackburn.

T. flindersi, Blkb. = *Tachys* (*Bembidium*) *rubicundus*, Macl.. I have no doubt about the correctness of this synonymy; Macleay's name was used in the genus *Tachys* as long ago as 1850, therefore the later name must be adopted.*

Habits :—Found under logs and stones in very damp situations.

Hab. : Queensland –Gayndah (Masters); N.S. Wales—Tamworth (Lea), Sydney and Wagga Wagga (Sloane); Victoria—Upper Ovens River (Blackburn), Lilydale (Sloane); Central Australia (Spencer); West Australia—Darling Ranges (Lea).

TACHYS HABITANS, n.sp.

Oval, convex. Prothorax convex, subcordate: elytra oval, convex, six rows of punctures on basal part; apex lævigate; submarginal stria indicated, punctate; lateral interstice very narrow, not convex; recurved striole of apex well marked. Black, shining; legs piceous, mandibles piceous brown.

Head convex, smooth; front widely bi-impressed anteriorly. Prothorax small, lævigate, widest rather before middle, not narrower across posterior angles than across apex; sides strongly rounded on anterior two-thirds, shortly sinuate before posterior angles; anterior margin truncate, anterior angles not marked

[redacted]

punctures, the anterior hardly noticeable among basal punctuation, the posterior on lævigate portion of elytra a little before apical declivity; external margin of apical striole carinate; marginal channel finely punctate; border passing round humeral angle on to base as far as fourth stria.

Length 2, breadth 0·8 mm.

Hab.: West Australia—Darling Ranges, Bridgetown, Pinjarrah (Lea).

Allied to *T. semistriatus*, Blkb., but differing in colour; its more elongate shape; the prothorax with posterior angles more prominent and explanate; the elytra proportionately narrower, less strongly punctate, with fewer punctures in the rows, especially the fifth and sixth.

Tachys ovatus, Macl.

T. (*Bembidium*) *ovatus*, Macl., = *Bembidium bifoveatum*, Macl.; I have seen the types and find these two species synonymous. It has a distinct recurved striole at apex of each elytron. Though usually of a pale testaceous colour, a specimen that is subpiceous has been sent to me by Mr. A. M. Lea, as coming from the Tweed River.

Habits:—Under stones in very damp situations.

Hab.: Queensland—Gayndah (Masters); N.S. Wales—Tweed River, Clarence River, Inverell, Tamworth and Sydney (Lea).

Tachys australicus, n.sp.

Robust, very convex. Prothorax convex, transverse, rounded on sides, a little wider across base than apex; elytra very convex, lightly striate near suture, sides smooth. Head and prothorax red or testaceous red, eyes black, elytra piceous or piceous black.

Head smooth, convex; front with two rather wide nearly parallel impressions; space between these impressions convex. Prothorax smooth, transverse, convex; sides strongly rounded without any sinuosity before posterior angles, oblique to base on each side behind posterior angles; basal area short, convex, defined by a strong transverse impression; posterior angles not

prominent, their summit acute; lateral basal foveæ obsolete. Elytra wider than prothorax, oval, very convex, declivous to peduncle, truncate on base; shoulders rounded, not marked; two, or at most three, lightly impressed striæ near the suture, first entire, lightly punctulate on disc, others only marked on disc (not reaching base), lightly punctulate; space between striæ and margin smooth and without discoidal punctures; recurved striæ of apex obsolete; marginal channel not deep along sides; three strong punctures near margin behind each shoulder, and two strong submarginal foveiform impressions on apical third.

Length 1·7, breadth 0·75 mm.

Hab.: N.S. Wales—Tweed River, Windsor (Lea).

The affinity of this little species is to *T. mitchelli*, Sl., from which it differs by its smaller size; dark coloured elytra; shorter and less oblique frontal impressions; elytra with only two or three striæ next the suture marked, the remaining part smooth (the striæ are linear and hardly punctulate, not rows of punctures as in *T. mitchelli*), &c.

TACHYS LEAI, n.sp.

Elongate-oval; prothorax convex, transverse, subcordate, narrower between posterior angles than at apex; elytra depressed, truncate at base, finely punctate-striate. Black, shining; legs

well marked transverse impression extending across base and posterior angles and defining the basal part, median very lightly impressed. Elytra wider than prothorax 1 mm.), depressed on disc, sides lightly rounded, base hardly emarginate, shoulders rather prominent, rounded; ly punctulate lightly impressed striae on each elytron of marginal channel), first entire, flexuous (approaching near base, second almost equally impressed as first on disc, towards base and apex, third and fourth much more impressed, not extending towards base beyond anterior puncture, fifth strongly impressed on anterior fourth shoulder, obsolete for remainder of its course; scutellar wanting; interstices flat, fourth with two discoidal es, the anterior at about one-fourth the length of elytra se, the other a little behind middle on course of third ird interstice very finely punctulate on apical declivity, channel deeply impressed along sides, three or four rong punctures behind the shoulders, apical declivity o oblique impressions on each side, the external strongly d near the margin (extending round the apex to join the stria), the inner short, placed closed to the external one.

h 2·4, breadth 1 mm.

N.S. Wales—Tamworth (Lea).

to me by Mr. A. M. Lea, to whose generosity I am for a specimen, and to whom I dedicate it.

details of structure this species resembles *T. murrum-*, Sl., from which it differs by its larger size, wider and onvex shape, impunctate prothorax, black colour, &c. o species form a well marked group among the Australian des, and it is evident they can only provisionally be con-congeneric with such species as *Tachys monochrous*, *T. flindersi*, Blkb., &c.

TACHYS MURRUMBIDGENSIS, Sloane.

N.S. Wales—Narrandera (Sloane), Tamworth (Lea).

TACHYS CAPTUS, Blackburn.

Habits :—Found under sticks and stones in damp situati

Hab.: South Australia—Port Lincoln, Adelaide (Blackt N.S. Wales—Mulwala, Urana, Narrandera and Junee (Sl Windsor and Tamworth (Lea).

TACHYS UNIFORMIS, Blkb.

Hab.: South Australia—Adelaide and Port Lincoln (: burn); West Australia—Beverley (Lea).

TACHYS ATRICEPS, Macleay.

Habits :—Found under logs in damp places near water.

Hab.: Queensland -Gayndah (Masters); N.S. Wales—(thool, Narrandera and Mulwala (Sloane); King's Sound (Frog

TACHYS LINDI, Blackburn.

Among the Bembidiides from King's Sound, in the M. Museum, the commonest species is one that I take to be *T.* Blkb. (var.) It differs from a type specimen of *T. lindi* re from Mr. Blackburn by being smaller (length 2·5 mm.) anc lighter build. *T. lindi* seems to be a variable species in siz colour marks its constant characters appear to be (a) a m

of the elytra infuscate; the head is blackish in mature specimens; the elytra are usually iridescent; the discoidal puncture on each elytron is situated along the fifth stria, considerably before the middle,—this is a constant character and valuable as an aid in the recognition of this species; the striæ of the elytra are faint and become obsolescent after the third.

Habits:—Found under sticks or stones near water in very damp situations.

Hab.: Queensland—Gayndah (Masters), Brisbane (Coates); N. S. Wales—Clarence River (Lea), Junee, Carrathool, Urana, and Mulwala (Sloane).

TACHYS MACLEAYI, n.sp.

Oval, subdepressed, lævigate. Head large, wide between eyes, prothorax subcordate; posterior angles strongly marked, acute; base (behind posterior angles) narrower than apex: elytra smooth, widely and lightly convex; two discoidal punctures on each elytron. Head piceous, prothorax obscure testaceous; elytra black with a large quadrate spot at shoulder, and a smaller round spot above apical declivity on each elytron pale testaceous; legs pale testaceous; antennæ pale testaceous with joints 3-6 infuscate.

Head lightly and widely bi-impressed between eyes. Antennæ filiform, long, slender. Prothorax lightly transverse, widest at anterior marginal puncture, angustate posteriorly; sides strongly rounded anteriorly, decidedly sinuate before posterior angles; anterior angles rounded; posterior angles triangular, prominent, acute; basal angles rounded; lateral border narrowly reflexed, reaching to sides of head; median line distinct; a well marked impunctate transverse line defining basal part of prothorax and reaching sides behind posterior angles. Elytra much broader than prothorax, wide between shoulders; base lightly rounded and margined on each side of peduncle; humeral angles obtuse; sides rounded, narrowed rather obliquely to apex; each elytron obtusely rounded at apex; three faint substriate impressions at apex of each elytron; anterior discoidal puncture just behind humeral

macula, posterior puncture in middle of subapical macula; border finely reflexed, extending from peduncle to apex; three or four setigerous punctures near margin behind shoulders, three foveiform submarginal impressions towards apex of each elytron.

Length 3, breadth 1·25 mm.

Hab.: King's Sound (Froggatt; Macleay Museum).

I know no Bembidiid closely allied to *T. macleayi;* its affinity is probably with *Bembidium bipartitum*, Macl., a species I have never critically examined. The legs and antennæ are long, the antennæ reaching back as far as the posterior maculæ of the elytra, the elytra are smooth without a submarginal stria on sides, and the marginal channel is not impressed.

PYRROTACHYS, n.gen.

Form parallel, depressed.

Head setigero-punctate, strongly constricted behind eyes; frontal impressions arcuate, extending backwards behind eyes.

Mandibles long, prominent, decussating.

Palpi with penultimate joint lævigate, swollen; terminal joint elongate, cylindrical.

r. Dr. G. H. Horn, in his definition of the Bembidiini, the margin interrupted posteriorly and with a distinct plica "* an important feature of the tribe.

PYRROTACHYS CONSTRICTIPES, n.sp.

ıte, parallel, depressed. Mandibles long, decussating; eeply emarginate; antennæ with all the joints pubescent; ɛ transverse, narrowed to base; elytra pubescent, finely Ferruginous; head reddish, eyes and adjacent parts ytra more obscurely coloured than prothorax, fuscous ure and towards apex; legs testaceous; under parts of prothorax reddish, of body fuscous; antennæ testaceous nfuscate towards apex.

strongly bi-impressed; vertex convex, finely punctulate; ns curved, diverging anteriorly and posteriorly, extend- ides of head behind eyes; front depressed between ns; spaces between impressions and eyes convex, pro- ıarply at base beyond sides of head; eyes prominent. arge, deeply emarginate, a transverse linear impression efore base. Prothorax depressed, transverse, widest at narginal puncture, lightly narrowed to base, evidently apex than base; sides very lightly rounded, shortly fore posterior angles; anterior margin truncate; anterior tuse; base truncate, a little oblique on each side behind angles; these prominent, obtusely dentiform; a short space along base, the impression defining this space rward in middle; median line well marked, not reaching ırgin. Elytra narrow, a little wider than prothorax m.), depressed, parallel on sides, truncate at base, widely ly rounded (without sinuosities) at apex; whole upper overed with a short pubescence; striæ very fine, not e after the fourth; marginal channel hardly impressed s, marked and punctate near shoulders; interstices flat;

* *Vide* Trans. Am. Ent. Soc. 1881, ix. p. 133.

three discoidal punctures on each elytron placed as in *Tachys leai* Sl.

Length 2·25-3, breadth 0·75-1 mm.

Hab.: N.S. Wales—Tamworth (Lea).

The description is founded on a specimen of the largest size. Mr. Lea regards the smaller specimens as representing a different species from the larger ones, but I have been unable to follow him in this; though, as the collector of a large number of specimens and a careful observer, his opinion in this matter should outweigh mine.

Appendix.

Specimens of a new species of *Tachys* were received from Mr A. M. Lea after the completion of my notes on the genus, and too late to enable it to be put into its proper place according to the table of species given on p. 356; however its affinities will be found indicated in the note following the description below.

TACHYS OLLIFFI, n.sp.

Robust, oval, convex; prothorax rather short, subcordate; five discoidal punctate striæ, a finely punctate submarginal stria and a well marked apical striole on each elytron. Black; legs, upper side of mandibles and basal joint of antennæ testaceous; antennæ and palpi fuscous

submarginal stria not impressed on sides, but consisting of a row of fine punctures near margin; marginal channel hardly impressed, finely punctate; submarginal interstice depressed on sides; third interstice with two fine setigerous punctures.

Length 2·2, breadth 0·85 mm.

Hab.: N. S. Wales—Forest Reefs.

Allied to *T. flindersi*, Blkb., from which it differs by its more convex shape, its colour; its prothorax with the sides less strongly sinuate posteriorly, the base narrower, the basal foveæ deeper, the basal angles less prominently acute, &c. The prothorax appears to the eye of about equal width at base and apex.

Named in memory of Mr. A. S. Olliff, late Government Entomologist for New South Wales.

Note—With reference to my paper "On the Australian *Clivinides* (Fam. *Carabidæ*)" in the preceding Part of the Proceedings, attention is called to the following:—

CORRIGENDA.

Page 150, line 14—for *C. adelaidæ* read *C. tumidipes.*
Page 171, line 20—*for* clypeus *read* clypeal.
Page 180—omit line 2.
Page 181, line 5—*omit* South Australia *et seq.*
Page 182, line 27—for *C. adelaidæ* read *C. tumidipes.*
Page 195, line 18—for *C. adelaidæ*, Blkb., read *C. tumidipes*, Sl.
Page 253, line 7—for *C. adelaidæ* read *C. tumidipes.*
Page 253, line 27—*for* on *read* in.
Page 254, line 29—for *C. adelaidæ* read *C. tumidipes.*
Page 255, line 31—for *C. tenuipes* read *C. gracilipes.*

TWO NEW SPECIES OF *PROSTANTHERA* FROM NEW SOUTH WALES.

By R. T. Baker, F.L.S., Assistant Curator Technological Museum, Sydney.

(Plates xxii.-xxiii.)

Prostanthera discolor, sp.nov.

(Plate xxii.)

A tall slender shrub, 6 to 9 feet high, branches terete, branchlets only slightly angular; branches, branchlets, and calyx very hoary; branchlets slender and often nodding.

Leaves quite glabrous, lanceolate or oblong-lanceolate, obtuse, narrowing into a petiole 2 to 3 lines long, ¾ to over an inch long and 1½ to rarely 3 or 4 lines broad, flat, entire, light underneath, dark coloured above, the midrib very prominent on the underside, particularly towards the petiole, but impressed above.

Flowers small in terminal compact heads or racemes, floral leaves reduced in size and very deciduous. Pedicels short, about half the length of the calyx. Calyx striate, very hoary pubes-

preferred to refer the species under consideration to the Section Euprostanthera. I am influenced in such a decision by its mode of inflorescence as well as by the fact that one or two species with only rudimentary appendages are already included in the Section.

In the species of Section Klanderia of *Prostanthera* the corolla tube is so very distinctive, being "narrow at the base, usually incurved and dilated upwards, the upper lip erect, concave or at least, the lower lip shorter or at any rate not longer and spreading," whilst in this species the corolla tube has the lower lip longer than the lobes, is not incurved or narrow at the base, points that would not justify its being classified with this Section.

Neither can it be included under any of the species enumerated under Bentham's Series Convexæ and Subconcavæ, as all these have axillary flowers and anthers with one appendage about twice as long as the cell.

Of the species described under Euprostanthera it most resembles *P. rotundifolia* and *P. violacea* in its close terminal racemes, but differs from them in the form and size of its leaves, shape of corolla, and, of course, virtual want of anther appendages.

It also differs from *P. incana*, *P. hirtula*, and *P. denticulata* in its leaves being perfectly flat, also in inflorescence, indumentum, and absence of anther appendages, and for the same reason it is excluded from *P. rugosa*, *P. marifolia*, *P. rhombea*, *P. spinosa*, *P. cuneata*, *P. linearis*, *P. phylicifolia*, *P. decussata*, and *P. empetrifolia*.

Its greatest affinity is perhaps with *P. incisa* and *P. Sieberi*, but its leaves are so distinctly or uniformly entire that I prefer to regard it as a connecting link between those two species and *P. rotundifolia*. From the description of *P. incisa* one might be led to think it was that species, but when specimens of each are placed side by side the differences are very marked.

From the above considerations I conclude that in botanical sequence it should come after either *P. incisa* or *P. Sieberi*, and be followed by *P. rotundifolia*.

PROSTANTHERA STRICTA, sp.nov.

(Plate XXIII.)

A densely bushy shrub, drying black, with hirsute, branches and branchlets.

Leaves petiolate, lanceolate, sometimes broadly so, dec obtuse, entire, the margins recurved, scabrous-hispid above, l rugose, dark coloured on the upper surface, whitish unde 4-9 lines long, 2-3 or even 4 lines broad, the midrib and veins prominent underneath and impressed above, givi surface a bullate appearance.

Flowers opposite, in pairs in terminal compact cyli spikes or racemes, occasionally leafy at the base. Pedicels s above 1 line long. Bracts linear-subulate, almost as long calyx. Calyx 1½ to 2 lines long, strongly ribbed towards tl hirsute, glabrous inside except towards the mouth, whe hoary pubescent, lips of about equal length and orbicula surrounding the fruit. Corolla not twice the length of the glabrous, the lower lip longer than the other lobes. Anthe one appendage exceeding the cell, the other adnate and sh

Hab.—Mt. Vincent, near Ilford, Mudgee Road, N.S.W.

The compact terminal spikes or racemes give the p distinctive appearance, and by this mode of infloresc

line inside at the base of the upper lip of the calyx,—characters absent in my species.

Following the classification of Bentham, I have placed this species in the Series Racemosæ from its terminal spikes; and in botanical sequence after *P. denticulata*, having greatest affinity with that species, whilst resembling and possessing also some of the characters of *P. rugosa* and *P. marifolia*.

EXPLANATION OF PLATES.

Plate XXII.

Prostanthera discolor.

Fig. 1.—Twig showing inflorescence.
Fig. 2.—, Fig. 3.— Individual flowers (enlarged).
Fig. 4—, Fig. 5—, Fig. 6— Stamens, back and front views (enlarged).
Fig. 7—Pistil and ovary.

Plate XXIII.

Prostanthera stricta.

Fig. 1—Twig with inflorescence.
Fig. 2—Individual flower (enlarged).
Fig. 3—Calyx showing bracts (enlarged).
Fig. 4—, Fig. 5— Stamens with appendages (enlarged).
Fig. 6—Calyx with seeds (enlarged).
Fig. 7—Seed (enlarged).

EUCALYPTS AND LORANTHS IN THE RELATIONS OF HOST AND PARASITE: AND AS FOOD PLANTS.

By J. J. Fletcher.

The object of this paper was to introduce a discussion of the question whether, as has been stated, certain Loranths may be said to mimick Eucalypts.

NOTES AND EXHIBITS.

Mr. Rainbow exhibited a spray of Silver wattle (
dealbata) with hymenopterous galls simulating the appear
Lepidopterous larvæ. The specimen was procured
Affleck, M.L.A., at Bundarra, N.S.W.

Mr. Baker exhibited specimens of the plants referred t
paper.

Mr. Froggatt exhibited a collection of Australian
comprising representatives of thirty genera and ninety
and including a number of rare species described by Mr.
in some of his recent papers on this family. Among th
species of note were *Ceronema banksiæ* found upon
serrata, *Aspidiotus pallens* on *Macrozamia*, *Mytilaspis s*
upon *Acacia pendula*, *Eriococcus spiniger* and *Ctenochito*

WEDNESDAY, SEPTEMBER 30TH, 1896.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, September 30th, 1896.

The President, Mr. Henry Deane, M.A., F.L.S., in the Chair.

Mr. Gilbert Turner, The Ridges, Mackay, Q., was elected a Member of the Society.

DONATIONS.

Melbourne University—Calendar, 1897. *From the University.*

Pamphlet entitled "Interzoœcial Communications in Flustridæ." By A. W. Waters, F.R.M.S., F.L.S. *From the Author.*

Pharmaceutical Journal of Australasia. Vol. ix. No. 8 (Aug., 1896). *From the Editor.*

Australasian Journal of Pharmacy. Vol. xi. No. 129 (Sept., 1896). *From the Editor.*

Zoological and Acclimatisation Society of Victoria—Twenty-fifth and Thirty-first Annual Reports (1888 and 1894). *From the Society.*

Museum of Comparative Zoology at Harvard College, Cambridge, Mass.—Bulletin. Vol. xxix. Nos. 5-6 (July, 1896). *From the Director.*

Linnean Society, London—Journal—Botany—Vol. xxx. N
211 (Sept., 1895); Vol. xxxi. Nos. 212-217 (Nov., 1895—Jul
1896): Journal—Zoology—Vol. xxv. Nos. 161-162 (July, 18
—Feb., 1896); General Index to Volumes i.-xx. (1838-90): Pr
ceedings, Session 1894-95: List, 1895-96. *From the Society.*

Linnean Society of London—Transactions. Second Series-Zoology. Vol. vi. Parts 4-5 (Feb.-June, 1896): Second Series-Botany. Vol. iv. Parts 3-4 (Dec., 1895—March, 1896): Vol. Parts 2-3 (Oct., 1895—May, 1896). *From C. Hedley, Es F.L.S.*

Royal Society, London—Proceedings. Vol. lix. No. 3 (June, 1896). *From the Society.*

Royal Irish Academy—Proceedings. Third Series. Vol. No. 5 (May, 1896): Transactions. Vol. xxx. Parts xviii.- (March-April, 1896): List of Members, 1896. *From the Academ*

Nederlandsche Entomologische Vereeniging—Tijdschrift v Entomologie. xxxix. Deel. Afl. 1-2 (June, 1896). *From Society.*

Société d'Horticulture du Doubs, Besançon—Bulletin. Sé Illustrée. No. 7 (July, 1896). *From the Society.*

American Museum of Natural History, N. York—Bulletin. Vol. vii. (1895): Vol. viii. (1896). Sigs. 10-12 (pp. 145-192—Aug.). *From the Museum.*

New York Academy of Sciences—Annals. Vol. viii. Nos. 6-12 (Nov., 1895): Memoir i. Part 1 (1895). *From the Academy.*

Academy of Natural Sciences of Philadelphia--Proceedings, 1895. Part iii. (Oct.-Dec.) *From the Academy.*

California Academy of Sciences—Proceedings. Second Series. Vol. v. Part i. (1895). *From the Academy.*

U.S. National Museum—Annual Report, 1893: Proceedings. Vol. xvii (1894): Bulletin. No. 48 (1895). *From the Director.*

Naturforschende Gesellschaft zu Freiburg, i. B.—Berichte. ix. Band. 1-3 Hefte (June, 1894—Nov., 1895). *From the Society.*

Gesellschaft für Erdkunde zu Berlin—Verhandlungen. Bd. xxii. (1895), Nos. 8-10. *From the Society.*

Colonial Museum and Geological Survey of New Zealand—Sixteenth, Seventeenth, Nineteenth, and Twenty-fifth Annual Reports on the Colonial Museum and Laboratory (1882-91): Reports of Geological Explorations during 1881, 1882, and 1883-84: Broun's Manual of the New Zealand Coleoptera. Parts iii. and iv. (1886). *From Professor T. J. Parker, D.Sc., F.R.S.*

Royal Geographical Society of Australasia, Queensland Branch—Proceedings and Transactions. 11th Session (1895-96). Vol. xi. *From the Society.*

Geological Society of London—Quarterly Journal. Vol. lii. Part 3 (No. 207; Aug., 1896). *From the Society.*

Société Néerlandaise de Zoologie—Compte-Rendu des Séances du Troisiéme Congrès International (Sept., 1895). *From the Society.*

Bureau of Agriculture, Perth, W.A.—Journal. Vol. iii. Nos. 21-22 (Aug.-Sept., 1896). *From the Bureau.*

Hooker's Icones Plantarum. Fourth Series. Vol. v. Pa (July, 1896). *From the Bentham Trustees.*

Verein für Erdkunde zu Leipzig—Mitteilungen, 1895 : W schaftliche Veröffentlichungen. iii. Bd. 1 Heft (1896). *the Society.*

Naturwissenschaftlicher Verein des Reg.-Bez., Frankfurt —Helios. xiii. Jahrg. Nos. 7-12 (Oct., 1895—April, 1 Societatum Litteræ. 1895. Jahrg. ix. Nos. 10-12 (Oct.-] 1896, Jahrg. x. Nos. 1-6 (Jan.-June). *From the Society.*

Department of Agriculture, Sydney—Agricultural Ga Vol. vii. Part 8 (August, 1896). *From the Hon. the Minis Mines and Agriculture.*

Pamphlet entitled "The Submarine Leakage of Ar Waters." By R. L. Jack, F.G.S., F.R.G.S. (July, 1896). *the Author.*

American Naturalist. Vol. xxx. No. 356 (August, *From the Editors.*

U S. Department of Agriculture—Division of Entomol Bulletin. No. 31 (1893): Division of Ornithology and Mamn —Bulletin. Nos. 5 and 7 (1895). *From the Secretary of culture.*

L'Académie Impériale des Sciences de St. Pétersbourg—Annuaire du Musée Zoologique. 1896. Nos. 1-2. *From the Academy.*

Royal Microscopical Society—Journal, 1896. Part 4 (August). *From the Society.*

Sociéte Hollandaise des Sciences à Harlem—Archives Néerlandaises. T. xxx. 2^{me} Liv. (1896). *From the Society.*

Société Royale Linnéenne de Bruxelles—Bulletin. 21^{me} Année, No. 9 (Aug., 1896). *From the Society.*

Royal Society of South Australia—Transactions. Vol. xx. Part i. (Sept., 1896). *From the Society.*

A MONOGRAPH OF THE AUSTRALIAN *MARSIPO-BRANCHII.*

By J. Douglas Ogilby.

In the present paper I have endeavoured to reduce to some appearance of order the history of the Australasian Lampreys and such meagre and for the most part inaccurate literature as appertains thereto. It is undeniable that some such work had become necessary owing to the diversity of the views held by the various writers who have approached the subject, and which culminated in the recognition by Sir William Macleay of four genera and six species, two of the former and an equal number of the latter having been founded on ammocœtal or immature individuals; this list I have found it necessary to reduce to three genera, each of which is represented by a single species.

The first author to whom the honour of recording the existence of a hyperoartian Marsipobranchiate in the southern hemisphere is due is Sir John Richardson, who, under the name of *Petromyzon mordax*, described and figured a species in the Ichthyology of the Erebus and Terror; six years later Dr. John Edward Gray published a "Synopsis of the *Petromyzonidæ*" in

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ralasian fauna it may be dismissed here with the remark rms the type of a genus *Exomegas*, Gill (*see p.* 425), and ure, only two examples being known to science, the first een picked up in the streets of Buenos Aires, and the llected in the Bay of Monte Video.

ears subsequently to the publication of Burmeister's e eighth volume of Dr. Günther's Catalogue of Fishes and his treatment of the conclusions of previous authors y the least of it, revolutionary; as a commencement *mordax*, Gray, from Tasmania, *Caragola lapicida*, Gray, *m anwandteri*, Philippi, and *P. acutidens*, Philippi, all m Chile, are associated under the common name *mordax*, though the author had at his disposal only Dr. o original specimens, one of which was in a notoriously ition; even the selection of the generic name was ate, *Caragola* having a slight precedence over *Mordacia*, gh, for reasons hereafter stated, I have adopted the *rdacia*, it is not to be expected that all other authors ually complaisant,* and we shall, therefore, be cumber-ges with a dual synonymy, one school of writers adhering *cia* while the other as strenuously upholds the claims of ; all which confusion would have been avoided by the ention to the strict rules of nomenclature. Continuing, ther united Gray's *Geotria* and *Velasia*, a conclusion not borne out by a more careful examination of the two d announced the occurrence of the latter in New

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nann & Eigenmann in " A Catalogue of the Fresh-water Fishes

Zealand waters, determining the species found there as Gray's *chilensis*, in which identification also I am not prepared to follow him; he also records under the same name a Lamprey from "Swan River," but whether this is the well known river of West Australia or some other does not appear (*see p.* 419). In the following year the same author described a new species of *Geotria* from Tasmania as *G. allporti*, a proceeding which appears unnecessary.

With this description the history of the Australasian Lampreys as species, so far as exotic writers are concerned, ceases, with the exception of two notices by Dr. Klunzinger of the occurrence of *Mordacia mordax* in the estuary of the Murray in 1873, and of *Geotria australis* as far west as King George's Sound in 1880.

With the cessation of outside interest in our Lampreys and the conclusion of the British Museum Catalogue, an unwonted and most gratifying activity on the subject of our fishes began to be manifested by Australian writers, and among the rest the Lampreys came in for their full share of attention.

The year 1872 is memorable for the production of two important essays, one of these being "The Fishes of New Zealand" by Capt. Hutton, to which was appended a short account of the edible species from the pen of Dr. Hector; the other, and in many respects the more important of the two, was contributed by

against the practice which is so prevalent among writers fishes of copying the descriptions and remarks from the Museum Catalogue without any attempt being made to their accuracy, and by so doing perpetuating error, creating sion, and indefinitely postponing the dawn of that accurate edge of our native fauna which every admirer of the ellous products of our country must ardently desire.

ry different, however, is Count Castelnau's contribution; in find by far the best account of two of our species as yet ibed, and though in the case of one of them the author had ntly determined the species wrongly, this does not detract the value of his remarks, while the very accuracy of his ption has enabled me to correct his error without difficulty, g which would have been impossible had he also been con- to be a mere copyist. Following his usual practice he has, ver, given generic and specific names to two individuals, one hich was an ammocete while the other had only just passed gh its metamorphosis and assumed the habits and in part tation of the adult. Count Castelnau's long experience d have taught him to avoid this pitfall. His paper, there- increased the number of Australasian species to six, distri- d among four genera, and at this they have been left up to present time by all writers, even Sir William Macleay lishing without comment the descriptions of these nominal s in his Catalogue of Australian Fishes, where, at least, we t have expected that some effort would have been made to ct the errors of his predecessors.

append here in parallel columns the names of the species as by Macleay and those which I recognise as valid in the wing paper

Mordacia mordax	*Mordacia mordax.*
Neomordacia howittii	
Geotria chilensis	*Velasia stenostomus.*
Yarra singularis	
Geotria australis	*Geotria australis.*
Geotria allporti	

In connection with the reinstatement of Gray's *Velasia* I wi to call the attention of those who may have the opportunity o examining this genus and *Geotria* during the ammocœtal stag and immediately after the metamorphosis has taken place, to th significance of the dental furrows in the latter genus; from th examination of the adult it appears to me that the evolution o the laminæ in *Geotria* will prove to be materially different fro that which holds good for *Velasia*.

Finally, it is hoped that the present paper will not only thro some light on the affinities of these various forms, but also induc some of our southern naturalists to spare time for the study o these interesting animals, of whose life history much still remair to be learnt.

Class MARSIPOBRANCHII.

The Myzons.

Skeleton membrano-cartilaginous; skull imperfectly develope not separate from the vertebral column, which consists of a stou notochord enveloped in a fibrous sheath; neural cartilages presen small; hæmal sheath present in the caudal region only. Lowe jaw, ribs, limbs, shoulder-girdle, and pelvic elements wantin Gills six or more on each side, represented by fixed sacs an destitute of branchial arches. Mouth suctorial and subinferio

Up to the present time but little has been definitely proven with regard to the degree of relationship which exists between the Marsipobranchiates on the one hand and the more recently and highly developed Teleostomes on the other, but the preponderance of evidence tends to show that the former are the survivors of a very primitive type of the Chordates, the oldest living representatives of which are to be found among the *Heptatrematidæ*.

The *Marsipobranchii* are divisible into two Orders, which may be broadly characterised as follows:—

Nasal duct tube-like, penetrating the palate; mouth without lips, eyes wanting; snout with barbels ... ... HYPEROTRETI*

Nasal duct a blind sac, not penetrating the palate; lips and eyes present, no barbels ... ... HYPEROARTII†

The first of these Orders contains two Families, the *Heptatrematidæ* and the *Myxinidæ*, the members of which are variously known as Hag Fishes or Borers; they are small, colourless, more or less parasitic, marine animals, living at a moderate depth, and wholly carnivorous. In places where they are common they do no inconsiderable damage to the fishermen by destroying the hooked fishes, into whose body they burrow and upon whose tissues they feed internally. They inhabit nearly all the seas of temperate regions, and three genera, *Polistotrema*,‡ *Heptatrema*,‖ and *Myxine* § have been differentiated.

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* ὑπερῴα, palate; τρητός, perforated.

† ὑπερῴα, palate; ἄρτιος, entire.

‡ *Polistotrema*, Gill, Proc. U.S. Nat. Mus. 1881, p. 30. Type, *Gastrobranchus dombeyi*, Lacépède. πολύς, many; ἱστός, vertical; τρῆμα, a perforation, in allusion to the increased number of external gill openings.

‖ *Heptatrema*, Dumeril, ? Diss. Poiss. Cyclost. Type, *Petromyzon cirrhatus* (Forster), Bloch & Schneider. ἑπτά, seven; τρῆμα, a perforation; = *Bdellostoma*, Muller, Abh. Ak. Wien, 1834, p. 79 (1836).

§ *Myxine*, Linnæus, Syst. Nat. i. 1758. Type, *Myxine glutinosa*, Linnæus. μυξῖνος, a slimy fish, from μύξα, slime; so named on account of the excessive amount of slime secreted by the mucous sacs of these animals, which is so great that the exudation from a single living example is sufficient to gelatinise a pailful of water.

So far, however, no Hyperotrete can be satisfactorily recorded as having occurred within our limits, but *Heptatrema cirrata*, being an inhabitant of the New Zealand seas, may occur or be represented by an allied form on our coast.*

The following synopsis will serve to show the most obvious characteristic of the three genera.

Eleven or more branchial apertures on each side; the base of the tongue situated between the seventh and eighth pair of branchiæ ... ... POLISTOTREMA.

Six or seven branchial apertures on each side; the base of the tongue situated between the anterior pair of branchiæ ... HEPTATREMA.

A single branchial aperture on each side ... ... MYXINE.

In all probability each genus is represented by a single valid species only; sexually they are hermaphrodite, but the ova and sperm attain maturity in each individual at a different period, the ripening of the latter taking place earlier in life than that of the former.

Order HYPEROARTII.

THE LAMPREYS.

Body anguilliform, naked, compressed or subcylindrical in front

less specialised. Dorsal fin more or less deeply divided by a notch, the posterior portion usually continuous with the caudal. Intestine with a rudimentary spiral valve. Eggs small, fertilised after extrusion. Sexes separate.

Etymology:—ὑπερῴα, palate; ἄρτιος, entire: in reference to the non-perforation of the palate by the nasal duct.

Distribution:—Seas and rivers of the temperate zones of both hemispheres.

All the Lampreys are subject to a metamorphosis; during the earlier stage of their existence, when they are known as *ammocœtes*, the eyes are in a rudimentary condition and they are entirely without teeth, their food consisting solely of vegetable substances gathered from the mud in which they live.

These ammocœtes are not unfrequently found of an equal or even larger size than individuals of the same species in which the eyes and teeth have already undergone development, this being due to arrested growth of these organs on the part of the individual.

Several distinct genera, such as *Ammocœtes*, *Scolecosoma*, &c., have been constituted for the inclusion of these immature forms.

The suctorial disk which is so characteristic of the Lampreys is useful to them in various ways; it serves as an instrument by means of which they are able to adhere to rocks, piles, sunken logs and the like, and so resist the force of the current and escape the necessity for such continuous and violent muscular exertion as would be imperative in an animal possessed of such feeble swimming powers; by it they are able during the spawning season to remove stones and similar obstructions from that portion of the river bed which has been selected as suitable to the formation of the nesting-place or "redd," and, after the task of depositing the ova has been completed, to replace the stones, and so minimise the danger to which the eggs would be exposed in the event of the occurrence of heavy floods during the period of incubation; and finally, by it they are enabled to attach themselves to the substances which form their food.

Up to the year 1894 ichthyologists were content to segregate the various species of Lampreys in a single family, to which the name *Petromyzontidæ* had been given by Risso as early as 1826 (*Eur. Mérid. iii. p. 99*), the title being altered six years later by Bonaparte (*Saggio, &c. p. 41*) to the more correct orthographic reading *Petromyzonidæ*. So long ago, however, as 1882 Dr. Gill (*Proc. U.S. Nat. Mus. v. p. 524*) proposed to separate the genus *Mordacia* (= *Caragola*) from the remaining *Hyperoartii* in a subfamily *Caragolinæ*. In the volume of the same periodical for 1894 (*p. 109*) the same author went a step further and raised his *Caragolinæ* to family rank under the name *Mordaciidæ*, he having in the meanwhile become reconciled to the use of *Mordacia*.

In this later paper the author, in support of the proposed family, pertinently remarks :—"It behooves those who may object to these families to consider why the character used to distinguish them should not be of equal value with the union or separation of the lower pharyngeal bones and like modifications generally used."

As Dr. Gill's contention appears to me to be perfectly sound, I have accepted the families as here defined by him.

Analysis of the Families of the Hyperoartii.

Two distant lateral tuberculigerous laminæ developed from the

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assuming too much—it follows that both in this character as well as in the dentition the Mordaciids have attained to a higher degree of development than the Petromyzonids.

MORDACIIDÆ.

Caragolinæ, Gill, Proc. U.S. Nat. Mus. v. 1882, p. 524.

Mordaciidæ, Gill, Mem. Nat. Acad. Sc. vi. p. 129, 1893 (*no definition*) *and* Proc. U.S. Nat. Mus. xvii. 1894, p. 109.

Two distant lateral tuberculigerous laminæ developed from the upper arch of the annular cartilage. Labial fringe rudimentary. Other characters similar to those of the Order.

One genus only.

Distribution:—Seas of South-eastern Australia, Tasmania, and Chile; entering fresh waters for the purpose of breeding.

MORDACIA.

Caragola, Gray, Proc. Zool. Soc. London, 1851, p. 239.

Mordacia, Gray, *l.c.*

Body elongate and slender, subcylindrical in front, the tail and a part of the body compressed; head small, oblong, attenuated, and somewhat depressed, with slightly pointed snout; suctorial disk moderate, oval, subinferior, extending backwards to the orbital region, with a well developed simple external lip, between which and the rim of the disk is inserted a regular series of short papillæ; rim of disk thin, forming a free, simple, cutaneous flap behind; surface of disk feebly plicated on its outer, smooth on its inner moiety. No gular pouch.* Branchial orifices small and subcircular, with a low raised rim and a well developed valve inserted anteriorly. Maxillary dentition consisting of two subtriangular plates, each of which is provided with three strong, sharp, hooked cusps, arranged in the form of a triangle; mandibular plate low and crescentic,

* The Chilian *Mordacia* is said by Philippi to be occasionally provided with a gular sac; this has never been observed in the Australian species, and is most unlikely.

cuspidate; disk with three strong unicuspid teeth anteriorly, the basal pair followed by two or three similar teeth, the sides and hinder portion with a series of broad tri- or bicuspid lamellæ; a row of small teeth inside the rim of the disk; tongue with two pairs of narrow multicuspid plates inserted on its dorsal surface and a finely cuspidate transverse plate below. Dorsal fin originating a short distance behind the middle of the body, divided into two portions (in the adult) by a short interspace, the anterior small, the posterior much larger and more or less continuous with the caudal, which is free or nearly so. Tail moderate, the vent situated well behind the middle of the second dorsal fin. No conspicuous series of pores on the head or body.

Etymology:—*Mordax*, voracious.

Type:— *Mordacia mordax*, Gray = *Petromyzon mordax*, Richardson.

Distribution:—South-eastern Australia, Tasmania, and Chile.

The absence of this genus from the New Zealand fauna when contrasted with its South American range is somewhat remarkable.

With regard to the propriety of retaining the generic name *Mordacia* for these Lampreys in place of *Caragola*, which both by a slight priority and by a more accurate diagnosis is fairly

constitutes priority, and it would be a pity to alter the well known name *Mordacia* to *Caragola*."

It is only in deference to the opinions as expressed above, of two so eminent scientists, that I have decided to adhere to the more generally accepted name *Mordacia*; nevertheless it is due to myself to say that the substitution of that name for *Caragola* is distinctly repugnant to me, so long as the rule remains in force, which provides that the earliest name, all other requirements having been complied with, shall take precedence. I cannot coincide with the contention that the accident of two names being published in the same volume, or even, as in this case, on the same page of the same volume, can under any circumstances justify our rejection of the earlier in favour of the later name; by so doing we are assisting to open a rift which may in course of time imperil the stability of the entire fabric, while the plea that a name should be retained because it is better known is sentimental and unsound, and therefore unworthy of consideration.

As is the case with all the Lampreys the dentary plates are provided with a horny covering, which may easily be removed in layers, but except for the necessary decrease in size both of plate and cusps consequent on the removal of each separate layer, no alteration in their appearance is noticeable, unless the entire corneous lamina be lost, and the underlying papillary prominence is thus exposed to view.

Gray's description of *Mordacia* was based on a specimen from Tasmania, the dentition of which was imperfect through the loss of the corneous lamellæ of many of the plates, while his type of *Caragola* was a Chilian example in which the lamellæ were intact; the diagnosis of *Caragola* is therefore more correct, surely an additional argument for the retention of that name.

Some interesting remarks on the pineal eye in this Lamprey, from the pen of Prof. Baldwin Spencer, will be found in the Proceedings of the Royal Society of Victoria, Vol. ii. 2nd Series, p. 102, 1890.

MORDACIA MORDAX.

Petromyzon mordax, Richardson, Voy. Erebus & Terror, Ichth. p. 62, pl. xxxviii. ff. 3-6*, 1845.

Mordacia mordax, Gray, Proc. Zool. Soc. London, 1851, p. 239, pl. iv. f. 6†, *and* Catal. Chondropt. p. 144, pl. i. f. 6, 1851; Günther, Catal. Fish. p. 507, 1870; Klunzinger, Arch. f. Natur. xxxviii. 1872, p. 45, *and* Sitzb. Ak. Wien, lxxx. i. 1879, p. 429 (1880); Castelnau, Proc. Zool. & Acclim. Soc. Vict. i. 1872, p. 229, *and* Edib. Fish. Vict. p. 17, 1873; Macleay, Proc. Linn. Soc. N. S. Wales, vi. 1881, p. 383; Johnston, Proc. Roy. Soc. Tas. 1882, p. 141 (1883), *and* 1890, p. 39 (1891); Stephens, Proc. Linn. Soc. N.S. Wales (2) i. 1886, p. 506; Lucas, Proc. Roy. Soc. Vict. (2) ii. 1890, p. 46.

Short-headed Lamprey.

Disk oval, its width when fully expanded somewhat less than its length, its posterior margin reaching to or nearly to the level of the eyes. Eyes conspicuous, the nasal tube opening a little in advance of their anterior margins. The distance between the extremity of the snout and the nasal opening is 21 to 26½ in the total length and 1¾ to 2 in that preceding the first branchial

front, the anterior cusp being rather stronger than the basal pair; mandibular plate with nine cusps, the last but one (rarely the last two) on each side much enlarged, the median one generally so; the discal dentition consists of three strong teeth anteriorly, the basal pair being on a line with the inner borders of the maxillary plates, they are similar in shape and arrangement to each triad of maxillary cusps, but differ in being entirely disconnected, though contiguous, at their bases; behind these a series of broad sharply edged lamellæ extends backwards along the sides of the disk close to the gular cavity and is continued behind the mandibular plate, each lamella is furnished with a strong cusp near its inner extremity and a smaller one at its outer, the lateral ones having a supplementary cusp outside and partially behind the inner cusp; between the discal lamellæ and the rim of the disk there is a row of small, sharp, hooked teeth; tongue with two narrow elongate plates arranged along each side of its dorsal aspect: the anterior pair are almost parallel, the distal extremity, however, being curved outwards and backwards, and armed with seven or eight fine subequal cusps and an enlarged terminal cusp, while on the linear portion seven cusps are present, the middle ones being the longest and the terminal one small; the posterior and outer pair of plates are inserted obliquely, with the convergent ends in front and in contact with the middle of the base of the inner plates; each is furnished with from twelve to fourteen fine cusps, which gradually decrease in size from the front; the ventral surface is armed at the base with a deep, transverse, V-shaped plate, the apex of which is radical; the outer border of each limb forms a deep concavity, which terminates in a stout, hooked cusp, outside the base of which the plate is curved inwards and backwards, both the recurved portion and the limb itself being armed with comb-like cusps, two or three of which, on either side of the apex, are somewhat enlarged. The vent is situated beneath or a little in advance of the commencement of the last third of the second dorsal fin; the length of the tail is 6$\frac{2}{3}$ to 7$\frac{1}{2}$ in the total length. The distance between the origin of the dorsal fin and the tip of the tail is 1$\frac{1}{4}$ to 1$\frac{2}{5}$ in its distance from

the extremity of the snout; the anterior portion of the fin is small and evenly convex, and passes imperceptibly into the dorsal integument at both ends, the length of its base is from 1 to $1\frac{1}{2}$ in the interspace between the two divisions of the fin and $2\frac{1}{3}$ to $2\frac{1}{2}$ in the base of the second portion, which is connected with the caudal fin by a more or less conspicuous rayless membrane;* the lower lobe of the caudal is more developed than the upper, to which it is joined round the extremity of the tail by a membrane similar to that which connects it with the dorsal. Head and body without conspicuous pores.

In the ammocœte both the dorso-caudal and the intercaudal membranes are well developed and the dorsal is continuous, but in large examples the intervening membranes have entirely disappeared.

In the Nepean specimen (125 millimeters) the dorsals are connected by a low cutaneous fold, as also are the second dorsal and caudal, the fold in this case being almost as high as the latter fin but rayless; the lower lobe of the caudal extends forwards to the vent, and there is also a distinct fold for a considerable distance in front of the vent; the maxillary teeth are as large as in the adults.

Upper surfaces rich olive brown, the sides golden brown, lighter [redacted]

)r. Gray, when engaged on his Catalogue of Chondropterygians ghtly removed the Tasmanian species from that genus under the ime *Mordacia*, and further proposed for a very similar Chilian imprey the name *Caragola lapicida*, the generic differences ied on being due to the defective dentition of the former.

n 1863 Philippi (*Wiegm. Arch. p. 207, pl. x. f. b.*) described figured a Chilian species under the name of *Petromyzon anwlteri*, and in the following year (*l.c. p. 107, and Ann. & ?. Nat. Hist. 3rd. ser. xvi. 1865, p. 221*) described yet another ies from the same territory as *P. acutidens*.

.ll these various forms, Tasmanian and Chilian, were united ther by Dr. Günther in 1870 under the common name *Mor-ia mordax*, a conclusion which—seeing that he had but a gle example from each so widely separated locality, and that of these (the Tasmanian) was admittedly in bad condition— o manifestly inconsiderate that I prefer to regard the Chilian n distinct from that described by Richardson until conclusive lence to the contrary shall have been brought forward.*

3reeding:—The habits of the Short-headed Lamprey during breeding season are quite unknown, but it is not probable t they differ in any marked degree from those of the more fully studied arctogæan species.

n the typical genus *Petromyzon* the eggs are minute, of rical form, and number many thousands; the ova and sperm first into the body cavity and are emitted from thence through abdominal pores; each ovum is enclosed in a delicate gelatinous ıbrane; fertilization takes place in the water after extrusion; the eggs arrive at maturity simultaneously after the lapse of ıt a fortnight.

n interesting account of the spawning habits of a species of omyzon is given by Prof. McClure and Dr. Strong, from

* Less confusion arises from calling them"—*i.e.*, species from remote cts—"different until shown to be the same, than from calling them until shown to be different" (*David S. Jordan, in lit.*).

observations made by them in the neighbourhood of Princeton New Jersey.

According to these authorities the eggs are deposited in shallow and clear water, so that the movements of the animals may readily be followed; the breeding season is in spring and the Lampreys remain upon the spawning grounds for two or three weeks; the nests are scattered thickly about the gravelly shoals, often only a few feet apart. Each nest is occupied by severa males and but a single female, which is conspicuous on account o its greater size.* When engaged in the act of spawning th Lampreys press together and cause a flurry in the water at th moment when the eggs and milt are in process of emissio Three or more layers of eggs are thus deposited, each layer bein covered by a thin sheet of sand or gravel, the parents alway returning to the same nest. When all the ova have bee deposited, the nest is strengthened by a dome-like mass pebbles and stones which the Lampreys carefully drag to the sp the nest is thus marked out as well as protected, and is said to made use of during the ensuing season †

The suctorial disk is used to keep the parents in position duri the period of the emission of the spawn.

Uses:—All the Lampreys are esteemed as food, and there [redacted]

e May meeting of the local Linnean Society; this specimen, s in the Macleay collection at the Sydney University, was ned from the Nepean River, near Camden, but though efforts since been made to obtain other examples in the same dis- they have hitherto resulted in failure.

Additional and reliable evidence of its presence in the Hawkesbury watershed has, however, been afforded by Mr. J. P. H of the University, who informs me that a friend of his is acquainted with this Lamprey and has caught it in the Wollondilly by the following ingenious method:—a pickle bottle is baited with a piece of raw meat and, a string having been tied round its neck, is sunk in a likely spot; the animals enter the bottle to feed, and on perceiving the motion consequent on its periodical withdrawal, attach themselves thereto by means of the suctorial disk, and are found enclosed when the bottle is drawn out upon the bank.

There can be little doubt that its presence has been overlooked in the southern rivers of New South Wales, such as the Towamba, Bega, Clyde, Shoalhaven, and others, and that when opportunity has been afforded for a thorough investigation of the fresh-water fauna of the colony, this and many other species which are now considered rare will be found to be comparatively plentiful.

The earliest published record of the occurrence of this Lamprey on the mainland is that of Dr. Klunzinger in 1872 (*Arch. f. Natur p 45*), and consists of the curt notice "*Mordacia mordax*, Rich. Murray River. 12 Cm." We learn by a note (*l.c. p 17*) that all the species sent to Klunzinger from the Murray River were taken near its mouth, and this therefore is the most westerly point from which I have been able to ascertain its presence.

During the same year in which Klunzinger's paper appeared Count Castelnau contributed to the Proceedings of the Zoological and Acclimatisation Society of Victoria a more full and interesting account of this Lamprey than any of his predecessors, his examples were collected in the lower portion of the Yarra, where he considered them to be common. He remarks that "their motions are very rapid, they are very voracious and pursue any object in the water,

and they adhere to it with an extraordinary and feroci- tenacity."

From the above quotation one gathers that prior to 1872 the Lampreys were not only common in the Yarra, but that it w an easy matter to study their habits there; how different it is the present day may be judged from the following:—"*Morda* seems sporadic and very rare generally; we got a few floati dead during the summer before last in the tidal Yarra" (*T. Hall, in lit. July, 1896*).

In his Catalogue of Tasmanian Fishes (*Proc. Roy. Soc. T 1882, p. 141*) Mr. R. M. Johnston records this Lamprey "abundant at certain seasons, clinging to the sides of perp dicular rocks under mill-shoots, Cataract Gorge, North E Launceston;" and again (*p. 62*) speaking generally of the T manian species, "the Lamprey, though abundant in some rive seems not to be in favour in the market, as they are rarely s there." Notwithstanding this alleged abundance I have found impossible to obtain a single specimen from the island.

Total length to 450 millimeters.

Type in the British Museum.

In the preparation of this article I have been able to exam seven specimens having a length of from 125 to 418 millimet four of these were collected in the lower Yarra, and were kin

A single median tuberculigerous suproral lamina developed from the upper arch of the annular cartilage. Labial fringe more or less conspicuous. Other characters similar to those of the Order.

Seven recent genera are recognised as valid.

Etymology.—πετρος, a stone; μυζαω, to suck; in allusion to the habit of clinging to stones and other substances by means of the oral disk.

Distribution.—Seas and fresh waters of the temperate and subtropical regions of both hemispheres, four genera belonging to the arctogaean and three to the austrogaean fauna, two of which latter inhabit Australian waters.

Analysis of the Australasian Genera.

Body elongate and slender; head small; suctorial disk very small, longer than broad, extending backwards midway to the eye; outer lip present, continuous behind; surface of disk plicated; no gular pouch; dental plates smooth; discal teeth approximate; ventribasal plate of tongue usually tricuspid; origin of first dorsal on the middle third of the body; head and trunk with conspicuous series of open pores, forming on the latter a well-marked lateral line ... ...

VELASIA, p. 407.

Body rather short and stout; head large; suctorial disk very large, broader than long, extending backwards more than midway to the eye; outer lip rudimentary; surface of disk smooth; gular pouch present; dental plates grooved; discal teeth widely separated; ventribasal plate of tongue bicuspid; origin of the first dorsal on the last third of the body; no series of pores on the head or trunk ... ...

GEOTRIA, p. 420.

VELASIA.

Velasia, Gray, Proc. Zool. Soc. London, 1851, p. 142.

Geotria, part, Gunther, Catal. Fish. viii. p. 508, 1870.

? *Neomordacia*, Castelnau, Proc. Zool. & Acclim. Soc. Vict. i, 1872, p. 232.

tant papillæ is inserted anteriorly and laterally; on the r
disk is a second series of broad, profusely fringed, f
papillæ, which is continued entirely round the hinder m
the disk where it is widely separated from the exte
surface of disk traversed by numerous series of cl
cutaneous ridges arranged more or less obliquely. I
pouch. Branchial orifices moderate and slit-like, with
functional valves in front and behind, the latter
Maxillary dentition consisting of a single transverse, c
quadricuspid plate, the outer cusps being smooth a
larger than the inner pair, their extremities entire; ma
plate low and crescentic, strongly cuspidate; disk with
series of moderate, diversely shaped teeth, from the
which radiate series of small, contiguous, graduated tee
are embedded in the hinder margin of the discal ridges;
sidiary teeth behind the mandibular lamina; tongue
single large plate, smooth on its outer, tricuspid
inner margin, along either side of its dorsal surfac
with a strong, transverse, basal plate, provided wi
(sometimes two*), slender acute cusps directed
Two well developed dorsal fins, the anterior inserted fa
the middle of the body, the posterior much the la
separated from the caudal by a moderate interspace; c
well developed, continued around the extremity of the
low, rayed membrane. Tail long, the vent situated b
origin of the second dorsal fin. Head with series of sm
pores; a series of widely separated pores along the midd

Etymology.—Unknown.

Type. *Velasia chilensis*, Gray.

Distribution. Coasts and rivers of south-eastern and southern Australia; ?South-western Australia; Tasmania; New Zealand; Chile.

VELASIA STENOSTOMUS.

Geotria chilensis, part, Günther, Catal. Fish. viii. p. 509, 1870.

Geotria australis, (not Gray) Castelnau, Proc. Zool. & Acclim. Soc. Vict. i. 1872, p. 227 (1873) *and* Edib. Fish. Vict. p. 17, 1873; Lucas, Proc. Roy. Soc. Vict. (2) ii. 1890, p. 47.

Geotria chilensis, Hutton, Fish. N. Zeal. p. 87 *and* (Hector) p. 132, 1872 *and* Trans. N.Z. Inst. v. 1872, p. 271, pl. xii. f. 2 (1873) *and* viii. 1875, p. 216 (1876) *and* xxii. 1889, p. 280 (1890); Macleay, Proc. Linn. Soc. N.S. Wales, vi. 1881, p. 384; Sherrin, Handb. N.Z. Fish. p. 36, 1886; Gill, Mem. Nat. Ac. Sc. Washingt. vi. p. 110, 1893 (not *Velasia chilensis*, Gray).

?*Petromyzon* sp., Kner, Voy. Novara, Fisch. p. 421, 1865.

Yarra singularis, Castelnau, Proc. Zool. & Acclim. Soc. Vict. i. 1872, p. 231 (1873); Macleay, l.c. p. 385; Lucas, l.c.

Neomordacia howittii, Castelnau, l.c. p. 232; Macleay, l.c. p. 383; Lucas, l.c. p. 46.

Narrow-mouthed Lamprey.

Disk oval, its width when fully expanded less than its length, its posterior margin reaching backwards midway to the vertical from the middle of the eye. Eyes rather inconspicuous, the nasal opening between their anterior margins. The distance between the extremity of the snout and the nasal opening is $16\frac{3}{5}$ to $17\frac{1}{4}$ in the total length and $1\frac{3}{5}$ to $1\frac{1}{4}$ in that preceding the first branchial orifice, which is situated a little nearer to the last branchial orifice than to the tip of the snout; the space between the last orifice and the extremity of the snout is $5\frac{2}{5}$ to $5\frac{1}{5}$ in the total length. Maxillary plate smooth, the inner cusps triangular

and acute, the notch between them deeper than those whic separate them from the lateral cusps, which are much longer an broader, with the inner border acute and convex, the tip pointe and the outer border obtusely rounded and almost linear, n separated by a groove from the basal portion of the plat mandibular plate with eleven short, blunt cusps, the outer one each side and the median one inappreciably larger; inner series discal teeth large, triangular and acute in front, broad an chiselled on the sides and behind; the middle teeth behind th maxillary plate are as large as the lateral ones; these teeth a twenty-six in number, and the anterior pair correspond to th inner maxillary cusps; in front of the interspace between th anterior pair a series of five teeth, which gradually decrease i size from within, extend in a straight line to the outer rim of th disk; from each of these a curved series of similarly develope teeth radiates outwards and backwards on either side; the disk armed laterally with similar series of graduated teeth, each ro corresponding to one of the enlarged inner teeth and being s strongly bent backwards towards the outer margin as to assum a subconcentric appearance; the surface of the disk is divided int series of low dermal ridges, on the inner posterior border of whic the teeth are embedded; these ridges are set so close togethe that the teeth of one ridge overlap the succeeding ridge; behin

Both dorsal fins rise gradually from the dorsal integument in front and terminate in a distinct though short posterior border; the outer border of the first dorsal fin is convex, its apical portion being situated somewhat in advance of the middle of the fin, and the length of its base is a little more than the interdorsal space and $1\frac{1}{2}$ to $1\frac{2}{3}$ in the base of the second, the outer border of which rises somewhat abruptly to above the origin of the median basal third and slopes gradually downwards from thence to its junction with the short posterior border, the anterior border being linear or somewhat convex; its height at the apex is one third to one half less than that of the first dorsal; the length of the tail behind the second dorsal is 1 to $1\frac{1}{2}$ in the base of that fin, which is entirely separated from the caudal by an interspace equal to about half the length of the latter fin; the caudal lobes are equally developed and are connected round the extremity of the tail by a low rayed membrane. A series of open pores extends from the throat along the rostral canthus to the antero-superior angle of the eye, where it curves downwards, and ultimately encircles three-fourths of the orbital ring, from the postero-superior angle of which it slopes backwards and downwards in the direction of the branchial orifice; there is a short series of similar pores above and behind the posterior angle of the closed disk, and a few others along the lower surface of the head; the lateral line is indicated by a series of pores which extend along the middle of the sides of the trunk, and there are similar series along each side of the bases of the fins.

Back dark slate-colour, belly and the greater portion of the sides white, the line of demarcation well defined especially on the tail; head dark gray above, silver gray on the sides and below, the latter colour extending backwards along the branchial region; fins reddish, broadly margined with slate-colour.

The following is Castelnau's description of the colours in the type example:—

"Dark maroon on the back, silvery on the sides and belly; on the middle of the back, a little before the insertion of the first dorsal,

begins a space of brilliant green, which extends to the tail; fins red, bordered with black."

Capt. Hutton describes the species as having "a broad band of green down each side of the back, the median line and the whole of the lower surface being pale brownish-white."

The brilliant green stripe on each side of the back appears, therefore, to be very distinctive of this Lamprey when alive or recently killed as compared with the uniform black or dark brown of the upper surface of *Geotria australis*.

It will be seen from the synonymy that I have included both of Castelnau's new species as synonyms of *Velasia stenostomus*, though from the size of the specimens, the insufficiency of the descriptions and the destruction or loss of the type,* it will always be impossible to say whether I am justified in my conclusions or, indeed, to what species his immature and ammocœtal forms should be united. If, however, the types are extant and on examination show that my identification is correct in one or other instance, Castelnau's name must necessarily have priority over mine.

Yarra singularis.

The following are the points in Castelnau's description which induce me to believe that his *Yarra singularis* is founded on an ammocœte of the Narrow-mouthed Lamprey. No generic diagnosis of *Yarra* was attempted by its author.

(1). "The body is elongate, being twenty-three times as long as high."

(2). "The upper lip is flat and considerably prolongated over the buccal aperture."

This inferior position of the disk is also true of *Mordacia* and *Velasia*, but not of *Geotria.*

(3). "The lateral line is well marked in all the length of the body."

In my two adult examples of the Narrow-mouthed Lamprey there is a conspicuous series of open pores down the middle of each side of the body, homologous to the lateral line in the true fishes; in neither of the other genera is there any trace of such line.

(4). "There is only one dorsal, which begins at about two-thirds of the length of the body and is joined with the caudal and anal."

The posterior position of the origin of the dorsal fin is a distinct character of the Australian Petromyzonids, and entirely precludes the possibility of this example being a larval *Mordacia,* in which genus the fin commences in the adult at no great distance—one-fourth to two-fifths—behind the middle of the body, and it is not conceivable that the permanent anterior portion of the fin should develop after the metamorphosis has taken place, rather than that it should be isolated by the absorption of the intervening membrane. The want of accuracy in the expression "about two-thirds" makes it impossible to judge absolutely between the claims of *Velasia* and *Geotria,* but the balance is somewhat in favour of the latter, in which the insertion of the dorsal fins in the adult is distinctly more posterior than in the former.

The continuity of the two dorsal fins and of the second dorsal with the caudal is merely indicative of the ammocœtal character of the individual, as also is the absence of eyes and teeth.

Two other characters in Castelnau's description apparently favour the claims of *Geotria;* namely, that the body "is entirely divided in annular rings" and that "the skin of the throat is rather extensible."

Taking into consideration the small size and imperfect de ment of the specimen, I do not consider that these char can be held to equal in importance the tenuity of the bod the presence of the lateral line.

Castelnau's reason for rejecting this ammocœte as the l form of a *Geotria* seems to be mainly based on the fact th had previously received "a very young individual, only inches long, having exactly the same form, the same dimen and the same dentition" as the specimen of *Geotria australi* which his description and measurements of the adult were d up, and which I shall show further on to have been in tr *Velasia stenostomus.* His words are:—"I should have th this might be the first state of *Geotria,** but we have just that I had a still smaller specimen of this which has entirel form of the adult."

That the length of the unique example of *Yarra singu* was "four and three-eighth inches," or one and a-half time length of the perfectly formed individual mentioned above, i sufficient reason for denying its identity with the ammoco *Velasia;* the difference in size is capable of explanation in at two ways, thus:—On the one hand the smaller specimen w having developed teeth, must have passed the ammocœtal s may possibly have been the young of the true *Geotria aust*

The uninterrupted connection of the dorsal fin is of course only significant as showing the immaturity of the individual, and is, therefore of no value as a generic character; this last sentence, however, is sufficient to separate the species from *Mordacia*, in which at all ages the dorsal and caudal fins are more or less intimately united, and in examples up to 125 millimeters are conspicuously so.

The presence of "fringes round the mouth" is also peculiar to *Velasia* and *Geotria*, the external lip and discal rim of *Mordacia* being almost smooth.

The tenuity of the body and the absence of dilatation in the head are however characters which belong to *Velasia* as opposed to *Geotria*, and I have, therefore, decided to associate Castelnau's *Mordacia howittii* with *Velasia stenostomus*.

Returning to the adult Lamprey, my reasons for considering that Castelnau's specimen was *Velasia stenostomus* and not *Geotria australis* as determined by him will be found below, the more important points of that author's description being taken seriatim.

(1) "The maxillary lamina is formed of four teeth, the exterior of which are flat lobes, and the two interior ones long, sharp pointed teeth."

This gives a fair description of the maxillary cusps of *Velasia* in which the inner cusps are as described and the outer are simple and smooth, while in *Geotria* the inner cusps are lanceolate and the outer notched and grooved.

(2) "Suctorial teeth in numerous transverse series, those situated backwards larger than the others."

The number of the series of discal teeth in *Velasia* and *Geotria* is about the same, but from the great expansion of the disk in the latter they appear to be much less numerous than in the former, to which, therefore, the wording of Castelnau's paragraph would more naturally point; in *Velasia* too the posterior discal teeth are as large as the inner lateral ones while in *Geotria* they are minute.

(3). "Lingual teeth two in number, straight, strong, conical."

Without a re-examination of the specimen it is impossibl say whether there were in fact only two ventribasal cusps, as third one might have been overlooked, either through careless defective examination as is the case with the specimen m kindly forwarded to me from the British Museum in which median cusp is as fully developed as either of the lateral on sometimes, however, it is absent as in Mr. Hill's specimen, but that case the bases of the lateral cusps are widely separated.

(4). "The distance between the two dorsals and the base of caudal is a little more than the diameter of the mouth."

It appears to me that this character in itself indubital proves the identity of Castelnau's Lamprey with *Velasia* as w be seen by the following measurements taken from my o specimens:—In my Tasmanian type of *Velasia stenostomus* longitudinal (longer) diameter of the closed suctorial disk is millimeters and the dorso-caudal interspace – which is, I presum what Castelnau intends—is 15; in *Geotria australis* on the co trary the longitudinal (shorter) diameter of the expanded—a therefore, further shortened—disk is 27 millimeters and the dor caudal interspace only 12, or less than a half.

(5). "The diameter of the mouth is equal to half the distan

figures, the circumference of the body being omitted
ary

	1	2	3	4
	V. stenostomus.	*G. australis*, Cast. *V. stenostomus.*	*G. australis*	*M. mordax*
gth (in millimeters)	468	513	375	413
centre of eye to total length ..	$14\frac{2}{5}$	$18\frac{1}{4}$	$8\frac{1}{3}$	$19\frac{2}{3}$
o first branchial orifice to total				
	10	$13\frac{3}{5}$	$6\frac{1}{4}$	$12\frac{1}{2}$
last branchial orifice to total				
	$5\frac{1}{2}$	$6\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{7}{10}$
first dorsal to tip of tail to its				
ce from tip of snout	$1\frac{1}{2}$	$1\frac{1}{4}$	$2\frac{1}{4}$	$1\frac{1}{6}$
al space to first dorsal	$1\frac{1}{3}$	$1\frac{1}{18}$	$1\frac{1}{4}$	1
irst dorsal to that of second	$1\frac{1}{2}$	$1\frac{1}{10}$	$1\frac{1}{10}$	$2\frac{1}{7}$
dal interval to caudal	$2\frac{1}{4}$	$1\frac{1}{7}$	$2\frac{1}{4}$	$2\frac{1}{8}$
tal length	$4\frac{1}{2}$	$3\frac{9}{10}$	$5\frac{9}{10}$	$7\frac{1}{4}$

e measurements only one (vii.) of Castelnau's shows proach to my *Geotria australis* than to *Velasia* while the two most important (v. and ix.) distinctly atter.

measurements connected with the head (ii. to iv.) are similar to those of my *Mordacia* that I cannot refrain uring that Castelnau had an example of each species d *Mordacia*) before him, and somehow got the mixed, and if further evidence is necessary as to the th of this conjecture, I may mention that in the table ents of *M. mordax* given by Castelnau (*l.c.* p. 230) between the extremity of the snout and the centre of ontained $14\frac{1}{3}$ times in the total length, or nearly the in my *V. stenostomus*. In the same table the length

of the first dorsal is erroneously given as 6½ inches; this is evident *lapsus calami* for 1½ inches.

Taking all the characters which I have referred to above, or against, together I consider that I am quite justified in association of Castelnau's species with *Velasia stenostomus.*

Petromyzon sp.

Kner's description of the ammocœte from the Waikato Riv New Zealand (*Voy. Novara, Fisch. p. 421*) gives no characters which any accurate judgment as to its relationship can be base the remark, however, that "the cavity of the suctorial disk closely beset with papillæ" is clearly more indicative of affinity *Velasia* than to *Geotria.* Günther is, therefore, probably right i conjecturing that "it is perhaps the young state of" *Geotr chilensis* (= *Velasia stenostomus*).

There is, however, one other character given by Kner whic puzzles me; he says:—"The large triangular nostril lies near above the margin of the sucking disk in the middle of the for head." Now in none of the species is the nostril situated "in th middle of the forehead," though it is of course placed on th middle longitudinal line of the head between or nearly betwee the anterior borders of the eyes; again the posterior margin o the suctorial disk does end beneath the middle of the forehead

s, who call them *Piharau* and used to pot them in large
Maori chiefs, as well as Henry I., have died from a
ampreys, the chiefs having the pick of large catches
of fish set apart for them."

on he writes :—" It is necessary to bear the construction
ith of the Lamprey in mind to understand what the
an when they say they see them 'sucking their way
fall in streams in hundreds at a time.' When thus
t is placed at the foot of the fall, and the fish being
ll into the net and are thus captured. They are also
in their eel-weirs. They ascend the Waikato (and
her rivers) when the whitebait is also ascending. If
hangi they have to be eaten with care, and a certain
ontain, the Natives say, must be expressed, or its effect
ilar to that induced by the eating of a certain kind of
loss of the gourmand's skin. Cooked as Europeans
them, this apprehension would not be entertained."

or also writes :—" Most of the New Zealand rivers are
y in summer by shoals of Lampreys, which are stated
sively delicate and well flavoured."

me this was written the occurrence of *Geotria australis*
ıland was unknown, nevertheless as the statement was
earsay evidence it must be taken as referring to both

bution :—Coasts and rivers of Victoria, South Aus-
nania, and New Zealand; ? West Australia.

river is the most widely known, the name itself is so little tinctive that I am inclined to believe that some stream, possib Tasmania, where it has now been proved beyond question to o is intended

Type in my possession.

Total length to 550 millimeters.

Three specimens have been available to me in the prepar of this description; for the first I am indebted to the author of the British Museum, who, on learning that I was workin the Australian Lampreys, with great kindness sent me one o New Zealand examples recorded in Dr. Günther's Catalogu *Geotria chilensis*, while a second example from the same Colony lent to me by Mr. J. P. Hill, only the anterior half of individual having been preserved; the third was forwarded t from Tasmania by Mr. Morton and measures 468 millimeters

GEOTRIA.

Geotria, Gray, Proc. Zool. Soc. London, 1851, p. 238.

Body rather short and stout, strongly compressed; head b oblong, with broad, rounded snout; suctorial disk very l elliptical, subterminal, extending backwards more than half to the orbital region, without free external lip, its rim thick fleshy, and bearing on its inner margin two series of frin

dorsal fins separated by a moderate interspace, inserted terior third of the body, the second entirely disconnected caudal and not much larger than the first; caudal fin continued around the extremity of the tail by a low nbrane. Tail short; the vent situated below or nearly origin of the second dorsal fin. Head and body with-icuous series of pores.

ology :—Unknown.

:—*Geotria australis*, Gray.

ibution :—Coasts and rivers of Southern Australia, , and New Zealand; Chile and the Argentine Republic.

nther, in the course of some remarks on *Geotria aus*-ites thus :—

ɔpi (*Wiegm. Arch. 1857, p. 266*)* has described a from Chile under the name *Velasia chilensis*; the was provided with the sac at the throat and the descrip-s with *Geotria australis*; so that we must assume either latter species occurs not only in Australia but also in that *Velasia chilensis* at a certain stage of development ed with a gular sac. If the latter be the case the istinction of the two species would be questionable" *'ish. viii. p. 509*).

the above quotation it is evident that some species of provided with a gular sac inhabits the rivers of Chile,

The function of the extraordinary pouch with which the members of this genus are furnished is quite unknown, nor have any observations as yet been made showing whether its presence is in any way connected with age, sex, or season.

Geotria australis.

Geotria australis, Gray, Proc. Zool. Soc. London, 1851, p. 238, pls. iv. f. 3 & v., *and* Catal. Chondropt. p. 142, pls. i. f. 3 & ii. 1851; Gunther, Catal. Fish. viii. p. 508, 1870; Hutton, Trans. N.Z. Inst. v. 1872, p. 272, pl. xii. f. 139a (1873) *and* xxii. 1889, p. 285 (1890); Klunzinger, Sitzb. Ak. Wien, lxxx. i. 1879, p. 429 (1880); Macleay, Proc. Linn. Soc. N.S. Wales, vi. 1881, p. 384; Sherrin, Handb. N.Z. Fish. p. 56, 1886; Gill, Mem. Nat. Ac. Sc. Washingt. vi. p. 110, 1893.

Geotria allporti, Günther, Proc. Zool. Soc. London, 1871, p. 675, pl. lxx; Macleay, l.c. p. 385; Johnston, Proc. Roy. Soc. Tas. 1882, p. 141, *and* 1890, p. 39.

Wide-mouthed Lamprey.

Disk elliptical, its length when fully expanded $1\frac{1}{4}$ in its breadth and $1\frac{1}{3}$ to $1\frac{2}{3}$ in the space between its anterior margin and the

ı: mandibular plate with ten cusps, the outer one on
·ute and directed inwards and backwards, the other
ılunt, sometimes rudimentary; the inner series of
are enlarged, triangular and acute in front, broad
l on the sides, those behind the mandibular plate
dually smaller towards the middle; these teeth are
in number and the anterior pair correspond to the
ary cusps; in front of the interspace between the
is a series of six teeth, which gradually decrease in
:hin and extend in a straight line to the rim of the
ıese and from the enlarged circumgular teeth extend
of graduated teeth; these series are widely separated
other and the teeth themselves are not in contact
re are no small teeth behind the postmandibular
ongue is armed with a single pair of dorso-lateral
of which is deeply grooved near its outer border,
·ongly convex, blunt, and entire, while the inner
adricuspid, the anterior cusp being only about half
ıf the other three, which are subequal in size; the
ɔntribasal plate is also grooved round the base of the
otherwise smooth; the cusps are two in number,
nd directed outwards and slightly upwards; there is
dian basal cusp behind the plane of the functional
·ent is situated beneath the origin of the second
ɔngth of the tail is $5\frac{1}{3}$ to $6\frac{2}{3}$ in the total length. The
reen the origin of the first dorsal fin and the tip of

front, but terminate in a distinct though short posterior border; the outer border of the anterior fin is evenly convex, its apical portion being situated above the middle of the base of the fin; and the length of its base is from one-fourth to three-fifths in the interdorsal space and $1\frac{3}{10}$ to $1\frac{2}{5}$ in that of the second dorsal, the outer border of which is also convex throughout, its apex being a little behind the commencement of the median third; its height at the apex is one-fifth more than that of the first dorsal; the length of the tail behind the second dorsal is a little more, equal to, or a little less than the base of that fin, which is entirely separated from the caudal by an interspace, which is equal to about two-fifths of the length of the latter fin; the caudal lobes are subequal in height, but the lower extends forwards much further than the upper; they are connected together around the extremity of the tail by a low rayed membrane. Head and body without series of conspicuous pores. Skin transversely plicated.

Black or dark brown above, lighter below; upper surface of head with a bluish, sides of head with a bronze tinge; lower surface of head, throat, and pouch grayish-white.

B r e e d i n g :—Unknown.

U s e s :—Similar to the other species.

D i s t r i b u t i o n :—Having already shown that Castelnau's *Geotria australis* belonged in truth to the preceding species we are now reduced to a bare statement of the habitat of this Lamprey in so far as it can be separated with certainty from

our southern coast in greater or less numbers during the season.

the name *allporti*, Johnston describes the Pouched as being "not uncommon in fresh water, Derwent, k, St. Leonards."

lew Zealand I can find no record except that of Capt. /ho claims to have received it from Stewart Island.

ngth to 500 millimeters.

the British Museum, as also is that of *allporti*.

ro specimens were available to me for examination, for hich I have to thank Mr. Alexander Morton, to whose assistance I am greatly indebted for this opportunity of ıg the position of our Australian Hyperoartians on a more is than they have hitherto enjoyed. Both my examples cted in Tasmania and measure respectively 325 and 375 s.

r to render this paper as perfect as the means at my ›ermit I append the following brief diagnosis of the rogean genus as given by its author.

Exomegas.

as, Gill, Proc. U.S. Nat. Mus. v. 1882, p. 524.

Type:—*Exomegas macrostomus*, Gill = *Petromyzon macrostomus*, Burmeister.

Distribution:—Atlantic coast of South America (Argentine Republic); very rare.

For further information concerning this form consult Burmeister, Anal. Mus. Buenos Aires, pt. 5, 1868, Act. Soc. Palæont. xxxvi., and Berg, Anal. Mus. La Plata, 1893.

THE BOTANY OF RYLSTONE AND THE OULBURN RIVER DISTRICTS. PART I.

'. BAKER, F.L.S., ASSISTANT CURATOR, TECHNOLOGICAL MUSEUM, SYDNEY.

ea of the colony treated of in this paper comprises the ivisions of the Counties of Phillip and Roxburgh,—a New South Wales, which I believe has not previously ored botanically.

rthern boundary of this area is the Goulburn River, es on the eastern slope of the Dividing Range, a few h-west of the town of Ulan, and flows easterly in a course, eventually joining the Hunter River a little Denman. It runs mostly through precipitous and moun-andstone ridges, and consequently is subject to ns,—flood-marks being found at a considerable height ordinary level. The country between the river and the Range consists principally of mountain ranges, with patches of good soil, derived from the disintegration of m the volcanic outcrops, approximating in area about niles. It is sparsely populated, there being only about

The main Dividing Range divides the district into the
and western watersheds.

The western slopes of the Range are much more fertile,
settlements are more frequently met with, it will be easily
stood that the indigenous vegetation has been considerably

The geological formation of the Main Range is the Hawk
sandstone (Triassic), which extends in outcrops down to a
the Goulburn River. Interspersed with the sandstone are
and the Tomago Series, which extend inland to beyond
a fact that may account for the occurrence on the eastern
shed of several western species.

The sandstone of the Range is succeeded on the western
towards the Cudgegong River by the Newcastle Series, and
have the Upper Marine Series, followed by Silurian, wi
crops of granite, quartz porphyries, felsites and limestones

I have not been able to obtain any authentic records
trips made by previous botanical collectors, but judging
references to localities in the "Flora Australiensis," I am
the impression that until visited by me this country was
cally a *terra incognita*. A. Cunningham must have been
outskirts, for in the "Flora Australiensis" (Vol. i. p. 443)
Cryptandra buxifolia, Fenzl, the locality is given as "
Hills on the meridian of Bathurst, on the parallel of 30° 50';

[redacted]

Acacia Muelleriana, J.H.M. et R.T.B.; *Helichrysum tesselatum*, J.H.M. et R.T.B.; *H. brevidecurrens*, J.H.M. et R.T.B.; *Daviesia recurvata*, J.H.M. et R.T.B.; *Isopogon Dawsoni*, R.T.B.; *Prostanthera discolor*, R.T.B.; *P. stricta*, R.T.B.

Three species new to the Colony were also found, viz.:— *Eucalyptus trachyphloia*, F.v.M., *Grevillea longistyla*, Hook., *Loranthus Bidwillii*, Benth. The range of other forms hitherto regarded as inland species, has been extended to the eastern watershed.

The following is a list of the Natural Orders, with the number of species collected:—

RANUNCULACEÆ	1	COMPOSITÆ	32
DILLENIACEÆ	4	STYLIDEÆ	1
VIOLARIEÆ	1	GOODENIACEÆ	9
PITTOSPOREÆ	5	CAMPANULACEÆ	3
CARYOPHYLLEÆ	1	EPACRIDEÆ	14
MALVACEÆ	4	JASMINEÆ	1
STERCULIACEÆ	3	APOCYNEÆ	1
LINEÆ	1	ASCLEPIADEÆ	1
GERANIACEÆ	2	LOGANEÆ	1
RUTACEÆ	9	GENTIANEÆ	2
OLACINEÆ	1	BORAGINEÆ	2
STACKHOUSIEÆ	1	SOLANEÆ	6
RHAMNEÆ	3	SCROPHULARINEÆ	2
SAPINDACEÆ	4	MYOPORINEÆ	5
LEGUMINOSÆ	58	LABIATÆ	8
ROSACEÆ	3	MONIMIACEÆ	1
SAXIFRAGEÆ	2	LAURINEÆ	2
DROSERACEÆ	1	PROTEACEÆ	27
MYRTACEÆ	38	THYMELEÆ	4
UMBELLIFERÆ	1	EUPHORBIACEÆ	5
ARALIACEÆ	1	URTICACEÆ	1
LORANTHACEÆ	4	CASUARINEÆ	3
RUBIACEÆ	5	SANTALACEÆ	7

CONIFERÆ	...	...	2	JUNCOCAEÆ	...	...
CYCADEÆ	...	...	1	CYPERACEÆ	...	...
ORCHIDEÆ	...	...	5	GRAMINEÆ	...	...
IRIDEÆ ...	..	...	1	LYCOPODIACEÆ ...		...
LILIACEÆ	...	..	6	FILICES	...	...

Excluding new species, the next most interesting finds were

(a) *Pomaderris philicifolia*, Lodd., a species only recorded fr this Continent from the "banks of subalpine streams under Australian Alps, descending into the plains of Gippsland on Hume and Murray Rivers, *F.v.Mueller*." It also occurs in T mania, and abundantly so in the northern island of New Zeala

(b). *Eucalyptus trachyphloia*, F.v.M.

(c). *Loranthus Bidwillii*, Benth.

(d). *Grevillea longistyla*, Hook.

All these three species occur in Northern Queensland, and o would hardly have expected to have found them at Murrumbo, they have never been collected in this Colony before.

I paid particular attention to the Acacias and have endeavou to elucidate some of the difficulties surrounding the classificat

already described the Mudgee representatives of this genus, and I look on my notes as the connecting link between the Mudgee and Coast Floras. I was surprised to find *E. obliqua* so far north, as it has previously only been recorded from southern New South Wales, although it was recently found at the National Park by Mr. F. Williams. The shape of the fruit in the northern specimens differs entirely from the southern form, as will be observed in the notes under this species.

Other Stringybarks dispersed throughout the district are *E. eugenioides*, *E. macrorrhyncha*, and *E. capitellata*. Three species of Ironbarks were met with, but they were not plentiful. The most valued timber is perhaps "Slaty Gum," *E. polyanthema*, var.; *glauca*, var.nov.; and I consider it a distinct gain to the botany of the Colony to have the correct botanical sequence of this valuable tree made clear. *E. albens*, Miq., is a tree also valued for its durable timber. *E. globulus* occurring at Nulla Mountain is also worthy of note.

My list of grasses is poor, as most of my specimens were lost in transit.

I have followed Bentham and Hooker's classification.

I desire to tender my sincere thanks to Mr. J. Dawson, of Henbury, Rylstone, Surveyor for the District, for his invitations to, and hospitality in, his several camps, from which I was enabled to reach without any expense what would otherwise have been inaccessible country; and I must also mention his kindness in placing at my disposal men, horses, and buggies in order to make my collections complete. He himself is no mean collector, for I am indebted to him for some valuable botanical material and specimens.

I must also acknowledge my indebtedness to Mr. G. Harris, of Mount Vincent, near Ilford, for his kindness while staying at his homestead during my visit to the district in 1893, for it was from there I made my collections of the flora on the watershed of the Turon and Capertee Rivers.

Class I. DICOTYLEDONS.

Sub-class I. POLYPETALEÆ.

Series 1. Thalamifloræ.

Ranunculaceæ.

Clematis aristata, R. Br. Barrigan Ranges; only a few pla seen, not in flower.

C. glycinoides, DC. The most common Clematis in t district; September and October.*

C. microphylla, DC. Murrumbo and Talooby; Septemb I have placed my specimens provisionally under t species as they very closely resemble it in form of le but differ in having anther appendages.

Ranunculus lappaceus, Sm. Murrumbo; September (flower a fruit).

Dilleniaceæ.

Hibbertia Billardieri, F.v.M., var obovata, Benth. Murrum October.

H. acicularis, F.v.M. Only found on the barren san soil at the top of the Gulf Road; leaves very rigid a

H. LINEARIS, R. Br., var. ? OBTUSIFOLIA, Benth. Murrumbo Gate, growing amongst the Ironbarks, *E. sideroxylon*. It seems to agree better with this doubtful variety of Bentham than any other described *Hibbertia*. I cannot bring myself to regard it as a variety of *H. linearis*, as an examination of the anthers shows it to have no affinity with the type of *H. linearis*, which has 15-20 stamens, while the Murrumbo specimens have from 60 to 70. If my specimens are this variety, then I think the specific name of *H. obtusifolia*, DC. (Syst. Veg. i. 429), should stand.

VIOLARIEÆ.

HYMENANTHERA DENTATA, R. Br. On the western watercourses of the main Dividing Range at Carwell, near Rylstone, and on the eastern watershed on the banks of the Goulburn River, near Murrumbo; September.

PITTOSPOREÆ.

PITTOSPORUM PHILLYRÆOIDES, DC. Near the summit of Range on the right bank of Bylong Creek, near Bylong; September. Never before recorded so far east, being strictly a dry country plant.

BURSARIA SPINOSA, Cav. All over the district and in some localities a perfect pest. At the foot of the Barrigan Ranges is a variety with very long leaves (2″), and almost spineless.

MARIANTHUS PROCUMBENS, Benth. Rare; October.

CITRIOBATUS MULTIFLORUS, A. Cunn. Barrigan Ranges.

CHEIRANTHUS LINEARIS, A. Cunn. Near Rylstone; rare; December.

CARYOPHYLLEÆ.

STELLARIA PUNGENS, Brongn. Exceedingly common on sandstone ridges. Mt. Vincent; November.

MALVACEÆ.

SIDA CORRUGATA, Lindl., var. **ORBICULARIS**, Benth. Not com only one plant seen, and that at Murrumbo. Th considered an inland species, with the exception o specimen obtained at Broadland, on the Hawkesb River, by Robert Brown; and its presence now on t Goulburn supplies the connecting link with the d country varieties; October (flower and fruit).

ABUTILON TUBULOSUM, Hook. Bylong; the most southern localit recorded; September.

HIBISCUS STURTII, Hook. Rare; October (flower and fruit).

STERCULIACEÆ.

STERCULIA DIVERSIFOLIA, G. Don. "Kurrajong." On most of the ridges in the district; November and December. These trees are never cut down, as the foliage is eaten by stock during times of drought. A peculiar fact in connection with this species was related to me by Mr. J. Dawson, surveyor for the district. He states that when a living tree of any other species is blazed and marked the sapwood and bark eventually grow over the marks, and

Series II. Disciflorae.

LINEÆ.

LINUM MARGINALE, A. Cunn. Goulburn River; September.

GERANIACEÆ.

GERANIUM DISSECTUM, Linn. Talooby and Murrumbo; October.

ERODIUM CYGNORUM, Nees. Murrumbo; in fruit in October.

RUTACEÆ.

ZIERIA ASPALATHOIDES, A. Cunn. Murrumbo; October. The two previous recorded localities for this Colony are Wellington and Hunter River.

Z. CYTISOIDES, Sm. Mt. Vincent and Rylstone; October and November.

BORONIA ? MOLLIS, A. Cunn. Bylong; the most northerly record if these specimens are those of *B. mollis*; November.

B. ANEMONIFOLIA, A. Cunn., var. ANETHIFOLIA, Benth. Murrumbo; not common; September.

PHEBALIUM DIOSMEUM, A. Juss. Goulburn River; October and November.

P. GLANDULOSUM, Hook. Only found at one spot, at the foot of Cox's Gap (Murrumbo side). I have my doubts about placing the specimens under this species, but do so as they come nearer it than any other N.S. Wales species. It resembles the Western Australian *P. tuberculosum* in the leaves being channelled above and the margins scarcely, or not at all, recurved, and the flowers are in sessile umbels exceeding the last leaves; a showy shrub; height about 10 feet; September and October. Since writing the above, Mr. Dawson has found it at Kerrabie. Flowers on filiform pedicels.

P. SQUAMULOSUM, Benth. Common on all the san ranges from Rylstone to Goulburn River; anc perhaps the most conspicuous shrub in the mo September, when it is in full flower. Height fr 20 feet, the coast representative rarely excee dozen feet.

PHILOTHECA AUSTRALIS, Rudge. On sandstone ridges. M the specimens incline to Sieber's *P. Reichenbac* but as the leaf varies in nearly every plant, placed them all under Rudge's species as sugges Baron von Mueller; September to November. white or pink, as distinct from the mauve colour coast plants.

OLACINEÆ.

OLAX STRICTA, R. Br. Murrumbo; October (flower and fru

STACKHOUSIEÆ.

STACKHOUSIA MONOGYNA, Labill. On moist damp flats; Sept and October.

RHAMNEÆ.

ALPHITONIA EXCELSA, Reissek. "Red Ash;" under the

[redacted]

I look on this specimen as a particularly interesting find from the fact that it has only previously been recorded from this Continent from the "banks of subalpine streams under the Australian Alps," so that now this new locality brings its range very much farther north. It occurs abundantly in the northern island of New Zealand, and also in Tasmania. I have compared this northern form with New Zealand and subalpine specimens, and it differs little from them. It has fewer leaf scars on the stems, and less numerous leaves; its height is also a little greater.

P. BETULINA, A. Cunn. Mount Vincent, near Ilford; November.

SAPINDACEÆ.

DODONÆA TRIQUETRA, Wendl. Bylong, Murrumbo; in fruit in September.

D. ATTENUATA, A. Cunn. Mount Vincent, near Ilford; November.

D. CUNEATA, Rudge. Murrumbo; in fruit in October. Rylstone; in fruit in December.

D. PINNATA, Sm. Barrigan Ranges; September.

Series III. **Calycifloræ.**

LEGUMINOSÆ.

OXYLOBIUM TRILOBATUM, Benth. Murrumbo; on sandflats near Goulburn River, and Kelgoola.

MIRBELIA GRANDIFLORA, Ait. Kelgoola; September.

GOMPHOLOBIUM UNCINATUM, A. Cunn. Bylong Ranges; November. The pedicels are longer and the flowers larger than those described by Bentham (Fl. Aust. ii. 46), but I do not think it can be referred to any other species.

G. HUEGELII, Benth. A few miles west of Rylstone; October.

DAVIESIA CORYMBOSA, Sm., var. LINEARIS, Lodd. A very na
leaved form found at Talooby, October.

D. LATIFOLIA, R. Br. Mount Vincent, near Ilford
Talooby. It is called "Native Hops" on accou
the bitter principle contained in its leaves. In
flower in October, and in fruit in November and De
ber.

D. GENISTIFOLIA, A. Cunn. Only seen in one locality,
Murrumbo; September and October; mostly on g
levels.

var. COLLETIOIDES, Benth. Kelgoola; source of
Cudgegong River.

D. RECURVATA, J.H.M. et R.T.B. Bylong; November.

PULTENÆA SCABRA, R. Br., var. MONTANA, Benth. Camboon
Talooby; October.

P. SCABRA, R. Br., var. MICROPHYLLA, var.nov. Byl
November. As my specimens possess smaller leaves
any described specimens, and are much shorter (abou
than the type, I propose to designate it a new vari

P. MICROPHYLLA, Sieb. Portland and Camboon; Octob

[redacted]

H. HETEROPHYLLA, A. Cunn. Kelgoola; in flower in September: at Talooby in fruit in October.

H. LONGIFOLIA, R. Br., var. LANCEOLATA, Benth. Found throughout the whole district under shelving rocks; flowers blue, not showy; in flower in September, and in fruit in December.

H. LONGIFOLIA, R. Br., var. PANNOSA, Benth. Murrumbo and Mount Vincent; September. This is a very marked variety compared with the previous one, the leaves being smaller and the petioles shorter; tomentum on the underside of the leaves, branches and petiole, dense, woolly, and rusty-coloured.

LOTUS AUSTRALIS, Andr. Camboon, Bylong, and Murrumbo; November.

SWAINSONIA MICROPHYLLA, A. Gray. Bylong; September.

S. GALEGIFOLIA, R. Br. Throughout the district; in flower and fruit in November; eaten by cattle.

GLYCINE CLANDESTINA, Wendl. Talooby; October.

DESMODIUM VARIANS, Endl. Bylong; October to November.

GLYCINE TABACINA, Benth. Murrumbo; in fruit in October.

KENNEDYA MONOPHYLLA, Benth. Murrumbo; October (flower and fruit); fairly common; Cox's Gap, with leaves large and stipules persistent.

*MEDICAGO DENTICULATA, Willd. Murrumbo; in fruit in October.

CASSIA EREMOPHILA, A. Cunn. In flower at Bylong in September; Murrumbo; in fruit in October.

C. AUSTRALIS, Sims. Not common; Bylong and Murrumbo; October to December.

* Introduced.

ACACIA LANIGERA, A. Cunn. Henbury and Rylstone; in flo in September and in fruit in December. The authentic pods of this species were obtained from locality (P.L.S.N.S.W. 2nd Ser. Vol. x.)

A. JUNIPERINA, Willd. Murrumbo, Road to Goulburn Ri September.

var. BROWNII, Benth. Barrigan Ranges.

A. ARMATA, R. Br. Cox's Gap, Murrumbo; September.

A. VOMERIFORMIS, A. Cunn. Rare; Kelgoola; Septem In the specimens collected there is a peculiar recur point or hook instead of the gland usually found on phyllodia of this species.

A. UNDULIFOLIA, A. Cunn.; var. SERTIFORMIS, Benth.; and v DYSOPHYLLA. Benth. Both forms are met with over whole district on sandstone ridges; var. *sertiformis* most abundant in the Capertee Valley, but is fou interspersed with var. *dysophylla* at Camboon, Bylo and Murrumbo.

A. VERNICIFLUA, A. Cunn. Between Rylstone and Mo Vincent; September.

A. PENNINERVIS, Sieb. This giant *Acacia* is found throu

At least three distinct forms are to be found in this district, viz. :—

1. Var. *normalis.*—Phyllodia lanceolate-falcate, obtuse or acuminate, thinly coriaceous, 3 to 5 inches long and 1 inch broad, 1-nerved and prominently penninerved, the margins nerve-like, and almost always with a short secondary nerve terminating in a gland a short distance from the base. Pod several inches long and 1in. broad, firm, margins parallel, often glaucous. A tree, up to 60 or 70 feet high. It is the bark of this tree that is highly prized for tanning.

2. Var. *lanceolata.*—A tall shrub: branchlets thin, angular, phyllodia uniformly lanceolate, narrowed at both ends, secondary nerve very indistinct; always narrower than in var. 1. Pod much lighter in colour than any of the other forms, about $\frac{1}{2}$ in. broad and 6 to 9 in. long.

3. Var. *glauca.*—A shrub of a few feet in height, branchlets red, terete, much stouter than in other varieties. Phyllodes broadly obtuse, glaucous, coriaceous, central nerve and margins very prominent, the gland rarely present, 3 to 5 inches long, 1 to 2 inches broad. Pod thickly coriaceous, 2 to 4 inches long, under one inch broad. Seed mostly orbicular.

(Mr. E. Dawson collected the whole series of pods and flowers upon which these remarks are based.)

A. NERIIFOLIA, A. Cunn. Talooby and Murrumbo, on sandstone ridges. Appears to have no local name. At Murrumbo Gate there are a few fair-sized trees, measuring 18 inches in diameter and 20-30 feet in height; September.

A. GLADIIFORMIS, A. Cunn. Rylstone; September.

A. HAKEOIDES, A. Cunn. Talooby; the nearest locality to the coast yet recorded for this dry country species; September.

A. SUBULATA, Bonpl. Quite local; only found at Murrun... Gate, growing amongst Ironbarks, *E. sideroxylon*. A tall, graceful shrub, with long pendulent green branch... September and October. The first recorded pods of t... his species were obtained from this locality (P.L.S N.S. ... W. 2nd Ser. Vol. viii.)

A. ?CRASSIUSCULA, Wendl. A common wattle through... the district; flowers in October and September and fru... its in December. I have preceded the name with a que... as I have never seen an authenticated *A. crassiuscu*...; but as I am acquainted with almost every other species of *Acacia* found in New South Wales I cannot place ... specimens under any other than this one. The fr... does not agree with Bentham's description, but perh... his were wrongly matched. It attains almost the ... of a young tree.

A. NEGLECTA, J.H.M. et R.T.B. Perhaps the most comm... of all the *Acacias* found on the sandstone ridges ... ranges. This is considered by some as *A. lunata*, ... the pods are entirely different from those described by Bentham (B. Fl. Vol. ii. p. 373).

A. HOMALOPHYLLA, A. Cunn. "Yarran." Talooby; ne... recorded so far east before.

A. IXIOPHYLLA, Benth. I have obtained only young pod... of this plant, so cannot speak with certainty as to its ... yet if it is not this species I do not kn... ...llodes are the most vis... ...for the m...

is a low shrub of a few feet, with long linear plurinerved phyllodes and short axillary racemes, with very few flowers in the head.

A. MELANOXYLON, R. Br. Only small trees seen; foot of Barrigan Ranges, Mt. Vincent and Kelgoola. The timber is not valued; August.

A. IMPLEXA, Benth. Barrigan Ranges; in early fruit.

A. LONGIFOLIA, Willd. (*a*). Var. *Bylongensis*, var. nov. This is quite a distinct variety from any described by Bentham (B. Fl. ii. 398). The length of the phyllode has already been recorded (P.L.S.N.S.W. 2nd Ser. Vol. viii. p. 311). The racemes are shorter and more compact than the type and other known varieties, resembling in some respects those of *A. doratoxylon*; in fact it might be looked upon as an intermediate form between these two species. Gulf Road and Camboon.

(*b*). Var. TYPICA, Benth. This variety is found on the Barrigan Ranges.

A. DORATOXYLON, A. Cunn. "Hickory." At Murrumbo, on the ranges on the right bank of the Goulburn River. It also probably extends to the Hunter River, as a specimen of "Hickory" timber from that locality, which I have compared with the Murrumbo "Hickory," is exactly identical. I consider the finding of this species here of some importance, as it has only previously been recorded in this Colony from the interior, as the "Spear-wood of certain tribes." Height generally from 15-30 feet; diameter up to 1 foot; in flower in September and in fruit in November and December.

A. CUNNINGHAMII, Hook., and also var. LONGISPICATA, Benth. Cox's Gap; September. I am indebted to Mr. J. Dawson for the pods of this *Acacia*. They hardly agree with any previous descriptions. Bentham had only unripe pods as he mentions (B. Fl. ii. p. 407), and

from the pods now in my possession I am inclined think his were not properly matched. Mr. Dawso specimens of fruit are attached to twigs, with t phyllodes, and stout, strongly 3-angled stems a early flowers, so that there can be no doubt abc their identity. They are not "long . . . . ve flexuose or twisted," but are straight or slightly curv 2-3 inches long, under 2" broad, valves *thin*, convex o the seed. Seeds small, oblong, longitudinal, funicle first straight and filiform, and gradually thickening in 3 or 4 folds under the seed.

A. DISCOLOR, Willd. Kelgoola; September; rare.

A. DEALBATA, Link. Occurs throughout the district fr Rylstone to the head of the Cudgegong; Septemb Its bark is never used as a tan, the inhabitants hav found out the superior tanning properties of the bl wattle (*Acacia penninervis*, Sieb.). An interesting feat of this *Acacia* here, is that the plants on the rid have short leaflets, 2-3" long, and the whole tree glaucous, whilst the plants growing on the plains an gullies have linear leaflets, 4 to 6 lines long, a glabrous; and the tree could very easily be mistaken

SCHIZOMERIA OVATA, D. Don. Gullies at the source of the Cud gegong River.

DROSERACEÆ.

DROSERA PELTATA, Sm. Camboon.

MYRTACEÆ.

CALYTHRIX TETRAGONA, Labill. Camboon and Murrumbo; in flower and fruit from September to December.

BÆCKEA CUNNINGHAMII, Benth. Found on the eastern and western slopes of the Dividing Range at Murrumbo toward the Goulburn River and Camboon, respectively. This is the first time it has been recorded on the eastern watershed; October.

LEPTOSPERMUM FLAVESCENS, Sm., var. GRANDIFLORUM, Benth. Bylong; November.

L. SCOPARIUM, R. & G. Forst. Sandy flats towards the Goulburn River; in fruit in September.

L. ARACHNOIDEUM, Sm. Camboon; in fruit in October.

L. LANIGERUM, Sm. Camboon; in fruit in October. I am not altogether certain about my determination in this case, as I failed to gather the flowers. The leaves are almost pungent-pointed and the fruits large. It is probably Bentham's variety (*d*) of this species.

L. PARVIFOLIUM, Sm. Camboon and Murrumbo; September and October. The Murrumbo specimens are characterised by an almost glabrous calyx, with triangular persistent lobes.

CALLISTEMON SALIGNUS, DC., var. ANGUSTIFOLIA, Benth. Murrumbo; October. I also collected a large-leaved variety at the same place.

ANGOPHORA INTERMEDIA, DC. Found mostly on the alluvial flats; very abundant at Bylong; February. This is a good fodder tree in time of drought. It is also an excellent shade tree for cattle. The timber is of very little value, but works up well in small cabinet work.

E. OBLIQUA, L'Her. "Stringybark." Gulf R species has never been found so far north b fruits differ from those figured as *E. obliqua* "Flora of Tasmania" (i. 136, t. 28), and al delineation in Baron von Mueller's "Eucalypt both instances the fruits are shown with a countersunk rim, but in my specimens *the hemispherical, with a flat, broad truncate* shape of the leaves corresponds in every par all the descriptions and figures published of

A microscopial examination of the anth them also to agree with Bentham's descript iii. p. 204).

This form of *E. obliqua* is evidently pecu South Wales, as it has also been found near t Park (F. Williams).

This species probably occurs also at Mudge not collected by Hamilton (P.L.S.N.S.W Vol. ii. p. 279).

E. CAPITELLATA, Sm. Found throughout the wl in both basaltic and sandstone country. Fro to the Goulburn River it goes by the name Stringybark," the same as *E. eugenioides*; settlers look upon them as one and the same

The large fruited form, the same as that found on "North Shore, *Woolls*" (B. Fl. iii. 206) predominates. The smaller fruited forms are occasionally met with, and as *E. eugenioides* is also to be recorded from here, I should like to venture the opinion that this latter species should be merged into *E. capitellata* or *vice versa*, and the two regarded as extreme forms of the same species. Bentham places *E. eugenioides*, Sieb., as a variety of *E. piperita*, but there appears to me very little connection except in the matter of bark.

The type fruits of this species resemble the fruits of *E. eugenioides* in every particular except size, and the smaller varieties cannot be distinguished from those of *E. eugenioides*; in fact, they are the *E. eugenioides* of some authors.

E. MACRORRHYNCHA, F. v. M. "Red Stringybark." This is considered the best stringybark in regard to durability of timber, and is highly prized. It occurs only on the western slopes of the ranges; November and December.

E. PIPERITA, Sm. "Blackbutt." Mount Vincent, near Ilford.

E. SIDEROXYLON, A. Cunn., var. PALLENS, Benth. "Ironbark." This variety previously had been recorded only from one locality, New England (C. Stuart). Its southern extension must now be brought to the Murrumbo Plains, where it is the only Ironbark. The buds are smaller than the typical Liverpool and Parramatta specimens of *E. sideroxylon*, and very much resemble those of *E. paniculata*. The blue glaucous leaves contrasting with the black bark give certain patches of bush a very pretty appearance. The timber is not considered of any value. Flowers profusely from September to December.

E. MELLIODORA, A. Cunn. "Yellowbox." Throughout the district, mostly on flats. Timber very durable, but difficult to obtain in any size, as most of the trees have a tendency to barrel in the trunks.

As A. Cunningham, C. Moore, and F. v. Mu each record a different bark (B. Fl. iii. 210), I may tion here that in all instances I found the bark "furro and presistent," and its inner surface, when freshly from the tree, has a very yellowish appearance as wel the exposed sapwood, hence its local name.

E. HÆMASTOMA, Sm., var. MICRANTHA. "Brittle Gum." C boon, on the western slope of the Range, and Mo Vincent, near Ilford.

E. POLYANTHEMA, Schau. "Red Box," "Slaty Gu There are three distinct varieties of this species t found in the district.

(*a*). In the neighbourhood of Rylstone it goes by name of "Red Box," and the timber is considere no value whatever. The trees are of no great hei have a dirty scaly bark at the butt but smooth otherw and are found on poor sandstone country. The le are uniformly oval, on fairly long petioles, veins obli marginal one removed from the edge, under three in long, and glaucous on both sides; flowers small flower in December; fruit turbinate, under two l

[redacted]

highly valued and considered equal to if not superior to Ironbark. The bark is smooth, with a silvery sheen. The leaves differ from those of the two other varieties in being much narrower and glaucous, the venation being the same as in the Camboon variety. The flowers are the smallest of the three varieties, the stamens are all fertile as in the first variety, the fruits glaucous, 1 line in diameter.

I was at first inclined to consider these as three distinct species (being so looked upon by the residents), but a microscopical examination of the anthers proved them identical. The anthers are cylindrical, "truncated, opening by terminal pores" in each variety, and as faithfully figured by Baron von Mueller in his "Eucalyptographia." There is evidently an error in Bentham's description of the anthers (B. Fl. iii. 214).

In closing these remarks I would like to point out that the New South Wales *E. polyanthema* differs considerably in the character of its bark from the Victorian form, which has "an ashy grey, persistent, rough and furrowed bark" (F v.M., B. Fl. iii. 213), while all the trees seen by me, and I have collected from the coast to the western slope of the Dividing Range, are smooth-barked. The leaves of the Sydney *E. polyanthema* are much larger and more ovate than any of the three varieties above enumerated.

E. HEMIPHLOIA, F. v. M. "Box." Throughout the district on the flats. It is not by any means the fine upstanding tree growing on the coast near Parramatta.

It was found in flower at Bylong and Murrumbo in October. Mr. A. G. Hamilton gives the flowering time at Mudgee, 40 miles east, as April and May, an evidence of the uncertain times of flowering of Eucalypts.

I have kept this species apart from the following, as I consider them quite distinct when the following

differences are taken into account, namely :—size, sh and venation of leaves; size of flowers and fruits; shape of anthers, which in this case resemble thos "Slaty Gum."

E. ALBENS, Miq. (E. HEMIPHLOIA, var. ALBENS, F.v "Box;" "White Box." Bentham considered this very distinct species" (B. Fl. iii. p. 219), but Baron Mueller has placed it as a variety of *E. hemiph* When seen growing in juxtaposition with *E. hemipl* its characteristic differences are very marked. Acc ing to Baron von Mueller it has a dull green, persis bark, but I have always found it with a whitish, pe tent chequered bark, somewhat approaching *E. hemiph.* from which it also differs in the larger, angular, se calyx (nearly 9‴ long), larger fruits, and in "the fol being usually glaucous or almost nearly white." Ant globular, opening at the side by almost circular p connective much developed.

The timbers of the two species are of equal merit. is always found growing under the Ranges on l banks of Bylong Creek, and gradually ascending t till meeting the "Slaty Gum," *E. polyanthema;* Sep

Splendid forests of this grand timber are being ring barked by the selectors. The flowers are very much sought after by bees, and are their standby during times of drought when other flowers are scarce; September.

E. GLOBULUS, Labill. A small-fruited variety occurs at Nulla Mountain, 24 miles east of Rylstone.

E. DEALBATA, A. Cunn. "Sallow." I am not at all certain that my diagnosis in this instance is correct, but I place the specimen collected at Ganguddy Creek, 18 miles east of Rylstone, provisionally under this species.

E. VIMINALIS, Labill. Found throughout the district on low levels, known under several vernacular names such as "White Gum," "Swamp Gum," "River Gum," "Brittle Gum," timber not used.

E. TERETICORNIS, Sm. "Red Swamp Gum," "Red Gum." Throughout the district on flats. A profuse flowerer during October, November and December. It is the common form with a long operculum. I am inclined to place this and the preceding species under one name.

E. STUARTIANA, F.v.M. "Woolly Butt." At Mount Vincent, near Ilford, and Ganguddy Creek, timber worthless.

E. PUNCTATA, DC. Kelgoola, at the source of the Currajong River. The dark copper coloured foliage of this tree makes it very conspicuous amongst other Eucalypts of the bush in this locality, where it goes by the local name of "Ironwood." At Mount Vincent, near Ilford, it is known as "Red Gum."

E. GUNNII, Hook. f. Occurs on both sides of the Dividing Range. Known as "Mountain Gum" at Kelgoola, but has no vernacular name at Murrumbo.

E. TRACHYPHLOIA, F.v.M. Only found at two places, Cox's Gap and Murrumbo Gate. It has not been recorded from any other locality in this Colony, and is known only

from the Burnett River, Queensland ("Bloodwood"). Kino exudes very freely. Timber hard, colour of Spotted Gum; not used. In fruit in September and October.

E. EUGENIOIDES, Sieb. "White Stringybark." Found on the watershed between Capertee and Turon Rivers, and also on the Barrigan Ranges, probably throughout the whole district. (See remarks under *E. capitellata*.)

EUGENIA SMITHII, Poir. Occurs plentifully in the gullies at the extreme head of the River Cudgegong, and known as "Lilly Pilly."

UMBELLIFERÆ.

ERYNGIUM ROSTRATUM, Cav. Rylstone; in fruit in December.

ARALIACEÆ.

ASTROTRICHA LEDIFOLIA, DC. The narrow-leaved variety was found at Camboon, in flower in October; and the broader leaved form with narrower panicles at Bylong.

Sub-class II. MONOPETALÆ.

LORANTHACEÆ.

LORANTHUS BIDWILLII, Benth. Only at one locality, Cox's Gap; on *Callitris* sp. Previously recorded only from Wide [redacted]

[redacted]

Coprosma hirtella, Labill. Mount Vincent, near Ilford; November.

Pomax umbellata, Soland. Camboon; October.

Asperula conferta, Hook. Camboon; October.

Galium Gaudichaudi, G. Don. Camboon. October.

Compositæ.

Olearia ramulosa, Benth., var communis, Benth. The common New England form, "with glabrous glandular achenes."

Vittadinia australis, A. Rich. Camboon; October.

V. australis, A. Rich., var. dissecta, Benth. Murrumbo; October.

Brachycome Sturtii, Benth. Camboon; October.

B. graminea, F.v.M. Talooby, Murrumbo; October.

B. linearifolia, DC. Camboon; October.

B. multifida, DC. Murrumbo; October.

Siegesbeckia orientalis, Linn. Murrumbo; October.

Eclipta platyglossa, F.v.M. Bylong; November.

Craspedia Richea, Cass. Murrumbo; October.

Cassinia ? leptocephala, F.v.M. In bud in November.

Ixiolæna leptolepis, Benth. Murrumbo; the most easterly locality recorded; generally regarded as an interior species; September.

Podolepis acuminata, R. Br. Camboon; bracts very acuminate in my specimens; October.

Leptorrhynchos squamatus, Less. Talooby; October.

Helichrysum scorpioides, Labill. Common; some specimens measure 2 feet in height; October.

H. bracteatum, Willd. A tall perennial of 2 feet, with long linear leaves; Murrumbo; October.

H. APICULATUM, DC. Throughout the district; Septembe December.

H. SEMIPAPPOSUM, DC., and var. BREVIFOLIUM, Sond. Candolle considered this variety as a distinct spe (*H. microlepis*, Prod. vi. 195). I was at first incli to agree with his view, but I have since found it grow from the root or base of the stem of the typical form, t proving what Bentham suspected (B. Fl. iii. 625)), t there is only one species. The two forms on the s stem make a unique herbarium specimen.

H. DIOSMIFOLIUM, Less. Throughout the district; Octo to December. Quite like the Sydney form.

H. BREVIDECURRENS, J.H.M. et R.T.B. Murrumbo; Octo

H. TESSELATUM, J.H.M. et R.T.B. Murrumbo, and the overlooking Bylong on the east of Torrie Lodge.

H. CUNNINGHAMII, Benth. Barrigan Ranges, Bylong; S tember. I have placed my specimens under species, although they differ from Bentham's descrip in having leaves over 1 inch long (½" Benth.) and 3 florets (3 Benth.)

HELIPTERUM ANTHEMOIDES, DC. Murrumbo November

SENECIO LAUTUS, Sol. Murrumbo, Talooby and Mt. Vincent; October.

S. VELLEIOIDES, A. Cunn. Talooby, Bylong Creek; October.

CYMBONOTUS LAWSONIANUS, Gaud. Camboon; October.

MICROSERIS FORSTERI, Hook. Not very common; only found at Murrumbo; September.

STYLIDEÆ.

STYLIDIUM LARICIFOLIUM, Rich. Camboon.

GOODENIACEÆ.

GOODENIA BARBATA, R. Br. An undershrub; on the eastern and western slopes of the Dividing Range at Camboon and Bylong respectively. This is its most northern locality; October and November.

G. DECURRENS, R. Br. Bylong Ranges; November.

G. OVATA, Sm. Bylong, under the shelter of rocks, mostly in moist situations; November. These specimens are *G. acuminata*, R. Br., placed under the above species by Bentham. The leaves are uniformly broadly lanceolate, denticulate, 1-1½ inches long, non-viscid and hoary on both sides.

G. HETEROPHYLLA, Sm. Camboon; October.

G. PINNATIFIDA, Schlecht. Murrumbo; October and September.

G. PANICULATA, Sm. Murrumbo; October.

SCÆVOLA MICROCARPA, Cav. Bylong Ranges; November.

DAMPIERA BROWNII, F.v.M. Cox's Gap; September and November.

D. ADPRESSA, A. Cunn. Murrumbo; the most easterly recorded locality; October.

CAMPANULACEÆ.

ISOTOMA AXILLARIS, Lindl. Bylong Ranges; November.

I. FLUVIATILIS, F.v.M. Bylong; November.

WAHLENBERGIA GRACILIS, A.DC. Everywhere; November.

EPACRIDEÆ.

STYPHELIA LÆTA, R.Br., var. ANGUSTIFOLIA, Benth. At Bylo and Murrumbo on the sandy flats and sandstone ridg Bentham (B. Fl. iv. p. 147) queries the colour of t flowers, but in every instance I found them red. I ha never found this variety near Sydney.

S. LÆTA, R. Br., var. GLABRA, var.nov I am in dou about the specimens placed here under a new variet but I prefer this to proposing a new species. Tl flowers are red, the sepals acute, and the leaves narro lanceolate,— characters not included under Bentham description of the species; Camboon; October.

ASTROLOMA HUMIFUSUM, Pers. "Groundberry." Everywher apparently in flower and fruit all the year round. A Murrumbo it is quite an erect shrub; from 1-2 feet hig

L. MICROPHYLLUS, R. Br. Kelgoola; September.

L. VIRGATUS, R. Br. Camboon; October.

L. MUTICUS, R. Br. Camboon, Bylong Ranges; flowers and fruit in November.

L. ESQUAMATUS, R. Br. Very common on sandstone ridges; September and October.

EPACRIS RECLINATA, A. Cunn. Kelgoola, Camboon and Talooby; October. This is its most northern limit.

E. PULCHELLA, Cav. Only found on one patch of sandstone at Kelgoola.

DRACOPHYLLUM SECUNDUM, R. Br. Bentham notes under this species (B. Fl. iv. 263) "the filaments are represented in the Bot. Mag. [t. 3264] as free; I have always found them adnate to the corolla-tube." In the specimens collected at Kelgoola the anthers were free.

JASMINEÆ.

NOTELÆA MICROCARPA, R. Br. On the summit of the Dividing Range at Mt. Vincent, near Ilford; November. This is the most southerly locality for it yet recorded.

APOCYNEÆ.

LYONSIA EUCALYPTIFOLIA, F.v.M. Bylong; the most easterly locality in this colony yet recorded for it.

ASCLEPIADEÆ.

MARSDENIA SUAVEOLENS, R. Br. Murrumbo.

LOGANIACEÆ.

LOGANIA FLORIBUNDA, R. Br. Common throughout the district. It is of a lighter green than the coast variety, and also does not dry so black; September.

GENTIANEÆ.

SEBÆA OVATA, R. Br. Camboon; October.

ERYTHRÆA AUSTRALIS, R. Br. Camboon; October.

Boragineæ.

Myosotis australis, R. Br. Only on the western slope o Dividing Range at Rylstone; December.

Cynoglossum australe, R. Br. "A tall, erect coarsely-hirsut plant." Murrumbo; October.

Solaneæ.

Solanum stelligerum, Sm.

S. violaceum, R. Br. On the eastern slope of the Dividin Range from top of the Gulf to Murrumbo; in flowe and fruit in October and November. It differs from th ordinary *S. violaceum* in having broader calyx-lobes.

S. violaceum, R. Br., var. variegata, var. nov. I found thi specimen growing between the bark and sapwood of *Ang phora intermedia* on the Gulf Road. The white marking gave it a very attractive appearance, and when firs approaching it I thought I had got something new. propose to call it a variegated form of *S. violaceum*.

S. amblymerum, Dun. Talooby; October. Bentham suggest that this may prove to be a variety of *S. violaceum*, bu

MYOPORINEÆ.

MYOPORUM ACUMINATUM, R. Br., var. ANGUSTIFOLIUM, Benth. Rylstone and at the foot of the Bylong Ranges. In flower in September, and in fruit in November.

M. DESERTI, A. Cunn. Rylstone and Murrumbo. I do not think it has been recorded further east than these two localities. Bentham (B. Fl. v. p. 5) in his description of this species gives the number of stamens as five, whilst I found only four in my specimens; September and October (flowers and fruits).

M. PLATYCARPUM, R. Br. Murrumbo, October. This species has previously been recorded only from the dry interior, *i.e.*, Murray and Darling Rivers.

EREMOPHILA LONGIFOLIA, F.v.M. On the western slopes of the Ranges to the east of Bylong Creek. This is the most easterly locality yet recorded; September.

LABIATÆ.

SCUTELLARIA MOLLIS, R. Br. Camboon. This is its most northern locality recorded; October.

PROSTANTHERA PRUNELLOIDES, R. Br. Murrumbo Ranges; October. A beautiful shrub, the profusion of large white flowers making it most attractive.

P. DEALBATA, R.T.B. At the foot of Cox's Gap, Murrumbo side. September.

P. STRICTA, R.T.B. Mount Vincent, near Ilford; November.

P. EMPETRIFOLIA, Sieb. Murrumbo, October.

WESTRINGIA LONGIFOLIA, R. Br. Murrumbo; October and November.

TEUCRIUM CORYMBOSUM, R. Br., var. MICROPHYLLUM, var.nov. Murrumbo; October.

AJUGA AUSTRALIS, R. Br. This species grows very luxuriantly Bylong, reaching sometimes 3 feet in height. A p form was found at Murrumbo.

Sub-class III. MONOCHLAMYDEÆ.

MONIMIACEÆ.

DORYPHORA SASSAFRAS, Endl. In the sassafras gullies at source of the Cudgegong River.

LAURINEÆ.

CASSYTHA PUBESCENS, R. Br. Camboon; October (flowers fruits).

C. MELANTHA, R. Br. Murrumbo; October (flowers fruits).

PROTEACEÆ.

PETROPHILA PULCHELLA, R. Br. On sandstone country; Sept ber (fruits).

ISOPOGON PETIOLARIS, A. Cunn. Bylong Ranges; October.

I. DAWSONI, R.T.B. Murrumbo, on the summit of

PERSOONIA CHAMÆPITYS, A. Cunn. At the top of the Gulf Road, on the loose sandy flat; October.

P. LINEARIS, Andr. The most common of all Persoonias, on worthless sandy ground and rocks; September (fruits).

P. RIGIDA, R. Br. Near the Goulburn River, Murrumbo.

P. CURVIFOLIA, R. Br. Only found on the western watershed, i.e., at Camboon. This is therefore its most easterly habitat yet recorded; October (fruits).

P. ?OBLONGATA, A. Cunn. Not common; on sandstone country at Kelgoola.

P. ?CUNNINGHAMII, R. Br. I have placed my specimens provisionally under this species as I was only able to obtain them in fruit. It differs from Bentham's description of *P. Cunninghamii* in having reflexed hairs on the branches, pedicels *not* glabrous nor slender, and a pubescent ovary, veins of leaf fairly prominent; Bylong Ranges.

GREVILLEA MUCRONULATA, R. Br. A small shrub occurring only at Murrumbo, and having "leaves rounded at the ends and shortly mucronate." This was the form found by A. Cunningham on the Hunter River (B. Fl. v. p. 443), and is made the type of the species by Bentham (*loc. cit.*); September and October.

G. LONGISTYLA, Hook. On the Ranges on the north side of Murrumbo Plains. The specimens obtained are referred to this species on the authority of Baron F. v. Mueller, who, in giving his reasons, says that Bentham's description of this species is incorrect as regards the length of pedicel, style, &c. My specimens differ from those described by Bentham in the length of the pedicels, which are under 6 lines, whereas Bentham gives 2-4 inches, the leaves are all under 1 line in width, whereas Bentham gives 2 lines; they are linear, pinnatifid or

divided into long linear segments. It is a very show shrub and worthy of cultivation, its large beautif crimson flowers and long linear leaves having a ve pleasing effect. It is considered the prettiest shrub the bush at Murrumbo, where it was first found in th Colony by Mr. J. Dawson, of Rylstone.

G. PUNICEA, R. Br. Kelgoola.

G. SERICEA, R. Br. Murrumbo; September and October.

G. TRITERNATA, R. Br. On the road to Macdonald's Fl Murrumbo; September and October (flowers and fruits

G. RAMOSISSIMA, Meissn. Camboon and Rylstone; Octobe

HAKEA MICROCARPA, R. Br. Throughout the district both grassland and sandy flats; October to December (flowe and fruits).

H. DACTYLOIDES, Cav. On the eastern slope of the Dividi Range, at the top of the Gulf, Cox's Gap and Murruml October.

LOMATIA ILICIFOLIA, R. Br. Fairly common on sandstone ridg at Kelgoola.

L. LONGIFOLIA, R. Br. Kelgoola; September (fruits).

P. COLLINA, R. Br. Camboon. The specimens are evidently the *P. Cunninghamii* of Meissn., which Bentham doubtfully places as a variety of *P. collina* (B. Fl. vi. 17); October.

P. LINIFOLIA, Sm. Everywhere, October to December.

P. CURVIFLORA, R. Br. A small delicate plant a few inches high. In flower at Murrumbo in October.

P. HIRSUTA, Meissn. A variety of this species with crowded, oval shaped leaves was found at Murrumbo; October. This is the most northern locality recorded for it.

EUPHORBIACEÆ.

POMADERRIS CORYMBOSA, Brongn. Top of Gulf Road and Murrumbo, September to November.

P. MICROPHYLLA, Brongn. Camboon; October.

BEYERIA VISCOSA, Miq. Murrumbo, on the banks of the Goulburn River, October (fruits).

BERTYA GUMMIFERA, Planch. Banks of Goulburn River, Murrumbo; September.

AMPEREA SPARTIOIDES, Brongn. Mount Vincent, near Ilford. Male plants.

URTICACEÆ.

FICUS SCABRA, Forst. Murrumbo; rare.

F. (STIPULATA) PUMILA, L. On the left hand side of the Gulf Road.

CASUARINEÆ.

CASUARINA STRICTA, Ait. This species occurs at Murrumbo, on the north western slope of one of the ranges bounding the southern side of the Murrumbo Plains, and also on the side and summit of Bald Hill, Camboon. These are the most northern localities recorded for this species, Mt. Dromedary in the south being the previous northern limit. It is mostly a swamp species, height 30 to 40 feet, in fruit in November and December.

C. SUBEROSA, Ott. et Dietr. The only species of sheoak see at Kelgoola, not very common.

C. DISTYLA, Vent. On the hills on the left bank of Bylo Creek at Talooby, and Murrumbo. A shrub of abo 10 feet high. In flower and fruit in October a November. This is the most northern locality record for this species. It differs from the coast form in havi slender branches and much more elongated fruits.

SANTALACEÆ.

CHORETRUM SPICATUM, F.v.M. Camboon (western watershed); October. If this is a correct diagnosis this brings the range of the species very much further east than previously recorded.

C. LATERIFLORUM, R. Br. Kelgoola; September.

C. CANDOLLEI, F.v.M. Murrumbo; September (flowers), October (fruits).

OMPHACOMERIA ACERBA, A.DC. Mount Vincent, near Ilford.

EXOCARPUS CUPRESSIFORMIS, Labill. "Native Cherry." Barrigan Ranges.

E. STRICTA, R. Br. Goulburn River; September.

Class II. MONOCOTYLEDONS.

ORCHIDEÆ.

DENDROBIUM TERETIFOLIUM, R. Br. Kelgoola.

CYMBIDIUM SUAVE, R. Br. Mostly in the forks of dead standing timber ("Box," "White Box," and "Apple Tree") at Bylong and Talooby.

DIURIS AUREA, Sm. Murrumbo; September.

D. SULPHUREA, R. Br. Talooby; September.

CALADENIA CARNEA, R. Br. Barrigan Ranges; September.

IRIDEÆ.

PATERSONIA SERICEA, R. Br. Murrumbo; October and September.

LILIACEÆ.

GEITONOPLESIUM CYMOSUM, A. Cunn. Rylstone; September (fruits).

BULBINE BULBOSA, Haw. Common throughout the district; September to November.

ANGUILLARIA DIOICA, R. Br. Common; October.

JUNCACEÆ.

XEROTES LONGIFOLIA, R. Br. Barrigan Ranges and Kelgoola.

X. MULTIFLORA, R. Br. Camboon.

X. FILIFORMIS, R. Br. Bylong and Camboon.

XANTHORRHŒA HASTILIS, R. Br. Rare; found only on the sandy flats towards Goulburn River, Murrumbo; September.

CYPERACEÆ.

SCHŒNUS ERICETORUM, R. Br. Murrumbo; September.

GAHNIA ASPERA, Spreng. Murrumbo; September.

G. PSITTACORUM, Labill., var. (?) OXYLEPIS, Benth. Kelgoola

CAUSTIS FLEXUOSA, R. Br. Kelgoola.

CAREX PANICULATA, Linn. Talooby; October.

GRAMINEÆ.

ANTHISTIRIA CILIATA, Linn. fil. Murrumbo; not common.

DANTHONIA SEMIANNULARIS, R. Br. Throughout the district.

STIPA SETACEA, R. Br. Rylstone.

* KOELERIA PHLEOIDES, Pers. Murrumbo.

* FESTUCA RIGIDA, Mert. and Koch. Murrumbo.

*CERATOCHLOA UNIOLOIDES, DC.} This American grass was found at Murrumbo.

Class III. ACOTYLEDONS.

LYCOPODIACEÆ.

AZOLLA RUBRA, R. Br. Very plentiful on Budden Creek. During the drought of 1895 it was the only green feed available for cattle, which seem to eat it with great relish.

FILICES.

TODEA BARBARA, T. Moore. Rare; only found at Camboon, which locality would probably be its western limit; in fructification in October.

ADIANTUM AETHIOPICUM, Linn. Barrigan Ranges.

A. FORMOSUM, R. Br. Barrigan Ranges.

NOTE ON CYPRÆA ANGUSTATA, GRAY,
Var. *subcarnea*, Ancey.

By C. E. Beddome.

This variety of this species measures, from the syphonal end to the posterior apertural notch, 24 mm.; it is 16 mm. wide and 12 high, *i.e.*, from the base to the most prominent part of the dorsum. It is therefore in all specimens I have seen a shorter, broader, and more depressed shell than the type. Of a uniform pale flesh olour on the dorsal surface, without any indications of darker loured bands or zones so frequently found in specimens of this ecies; base almost white from end to end, along the aperture, ut approaching the thickened porcellanous sides of the base it ades off to a duller flesh colour than on the dorsum. This teral intensified coloration continues forwards and backwards to e ends round which it is uninterruptedly continued with a dense orcellanous deposit, which characteristically separates the entral from the dorsal aspects; this lateral thickening is sub-ngulated, projecting beyond the surface with a slight upper curved margin causing it to be shallowly channelled, most arked on the peristome, which is also less uneven than in most mples of *C. angustata;* in many forms of the latter the elevated rface points correspond with elevated ridges, which can be seen d felt distinctly running across the dorsum of the body whorl. notice this character most marked in the zoned varieties of the ecies; they are less marked in this variety. Showing through e thickened porcellanous margin 8 to 10 small dark chocolate oured round spots exist on each side, but are only hazily ined.

The aperture is proportionally wider than in the type form and her more bent towards the left posterior end. The peristome

margin of the aperture is wider and more bent towards the left than in typical forms such as I have, by me dredged alive in Hobart Harbour on Coral; it has from 20 to 22 teeth, quite white, inclined forwards, blunter, and spread outwardly more over the base than in the typical specimens; in the latter forms the teeth are sharp pointed, projecting into the aperture, and have a rusty tinge.

On the left columellar margin there are 20 small white teeth pointed directly across the aperture scarcely extended over the base surface, but are seen extended down into the curved edge of the columellar margin as it enters the cavity of the shell. The base, unlike the typical *angustata*, is densely porcellanous and white; as a rule in the type it has a bluish tinge, whiter towards the channelled ends of the aperture.

There is an absence of the dark colorations on either side of the dorsal aspect of the anterior channel edges so characteristic of the type forms, and this syphonal channel is not so produced or notched, being obliterated by the more callous margin of this form being continued directly round the ends. The dark zoned specimens from the Derwent waters have many marginal spots, at least 30, and although the angulated margins which separate the base from the dorsal surface are decidedly thickened, they do not round off the chanelled ends of the aperture as in this variety.

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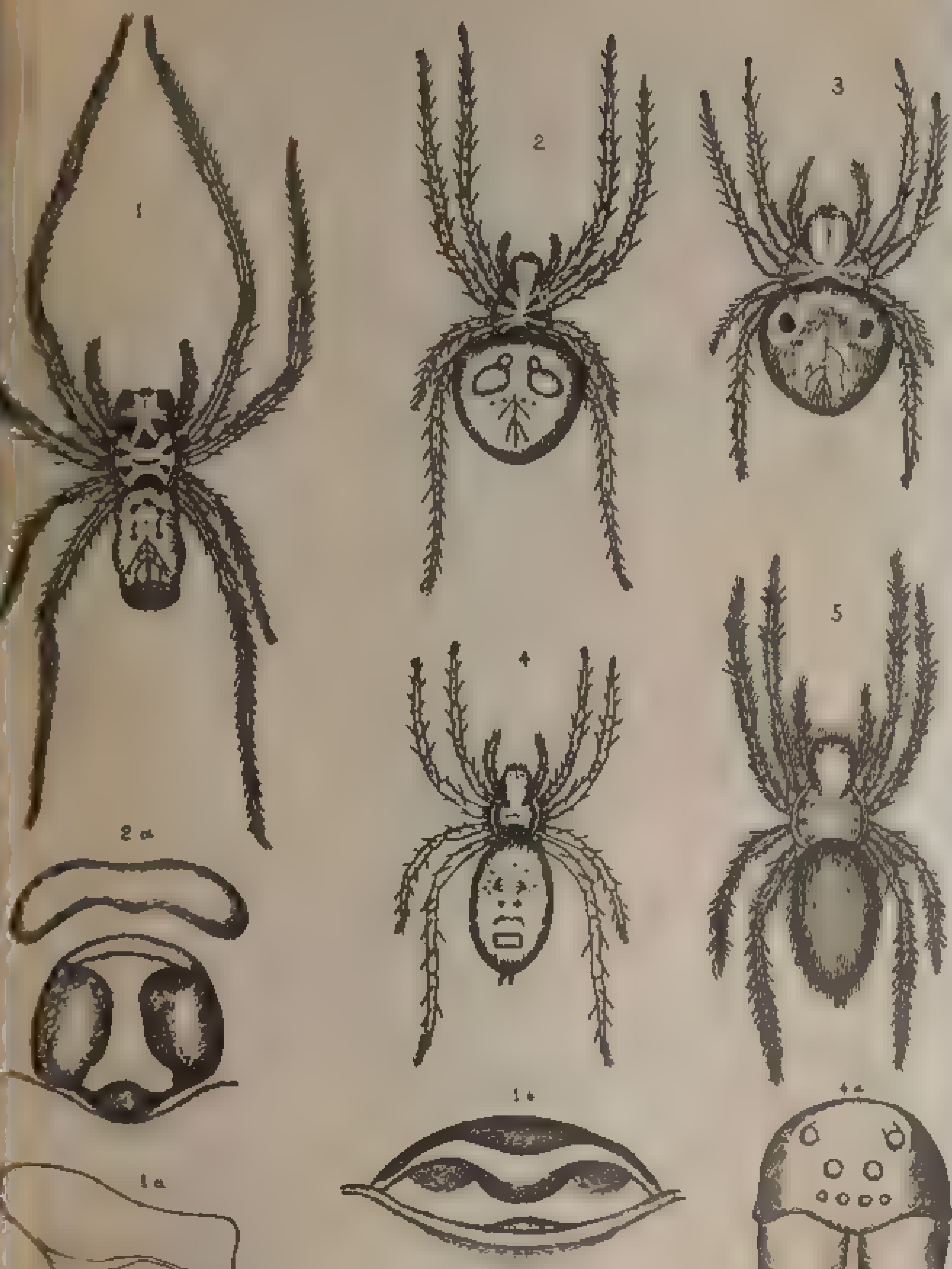
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P.L.S.N.S.W. 1896.

Pl. XIX.

P.L.S.N.S.W. 896 PL. XX

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Edgar R. Waite, del.

ACTINOPUS FORMOSUS, Rainbow.

PROSTANTHERA DISCOLOR, R.T.B.

RNSW 1896

Pl XLI

R T Baker del ad nat

PROSTANTHERA STRICTA, R T B

[SEPTEMBER 30TH, 1896, *contd.*]

THE SOOTY MOULD OF CITRUS TREES: A STUDY IN POLYMORPHISM.

(*Capnodium citricolum*, n.sp.)

BY D. MCALPINE.

(*Communicated by J. H. Maiden, F.L.S.*)

(Plates XXIII.-XXXIV.)

CONTENTS.

This disease has been known for a long time, chiefly in Southern Europe, and now wherever Citrus trees are grown. It has had various common names in different countries, such as "Morfea," "Fumago," "Nero" in Italy; "Russthau or Sootdew" in Germany; "Sooty Mould" in Florida; and "Fumagine," "Black Mildew,"

"Black Blight" among ourselves. It is also often called "Smut" from its appearance, but does not belong to that division of Fungi which includes the true Smuts or *Ustilagineæ*. And the scientific names applied to it have been equally varied, for it assumes a variety of different forms to which different names have been given. In fact this "Sooty Mould" affords a very good illustration of what has been called Polymorphism—the same fungus appearing under different guises at different stages of its development, and it is this feature which will receive special attention here.

In order to prove the fact of polymorphism it would be necessary to sow pure cultures and watch the development of the different forms under strictly test conditions, for otherwise the forms found together might be really different, and constitute merely a case of association. It is quite conceivable that the exposed surface of an Orange or Lemon leaf might be invaded by a fungus forming a dense felt by the intertwining of its filaments, and this would entangle, like a spider's web, any other spores wafted thither, so that a small community of organisms might be established, not necessarily genetically connected.

Instead of making artificial cultures, however, I have simply examined a number of specimens under natural conditions from different parts of this colony, as well as New South Wales and

As already stated I have examined specimens from the three colonies of Victoria, New South Wales, and South Australia during the months of July and August. In Victoria I selected specimens from an orange tree in my own garden at Armadale; from another garden at Kew, a suburb of Melbourne; from the Royal Horticultural Gardens, Burnley; from a few other gardens; and from lemon trees grown on a large scale at Doncaster. The results obtained have been compared with those of South Australian and New South Wales specimens, and there is no doubt but the same fungus is common to all. The chief results will now be given from each district separately, to see how far similar forms are associated together in widely separated districts.

There is not only variety in the number of forms met with, starting with the gonidial and ending with the perithecial stage, but also in the different organs, and I have endeavoured to give some idea of this by representing variations in the characters of the self-same organs.

Victorian Specimens.

Doncaster specimens.—Doncaster is situated about 10 miles from Melbourne, where there is a well-known orchard with 23 acres mostly under lemon-trees, and in some situations and on certain trees there was abundance of the "Sooty Mould." The variegated lemon supplied the material, and as there was a greater variety of reproductive bodies met with than in any of the other specimens, it will be convenient to begin with it and give a general description of the fungus. It occurs on the living leaves particularly on the upper surface, but it may also appear more or less on the under surface. It is also on the branches as well as on the fruit, usually the upper or stem end as the fruits hang down. It forms black soot-like incrustations, often covering the entire upper surface of the leaf and peeling off in flakes. It is entirely superficial, not penetrating the tissues in any way, and therefore does not act as a parasite. There are all sorts of gradations in the nature and extent of the fungus. It may appear at first just like a sprinkling of dust on the leaf

(in fact growers do confound it with dust), then of a dark grey, peeling off as a thin papery layer, and finally as a crust, soiling the fingers when rubbed. At times ther considerable admixture of dust with the filaments, and th usually checked in its development. The depth of the co evidently largely influenced by the amount of more colourless and coloured hyphæ respectively, both of whi usually always present.

Fungus described.—When examined under the microsco seen to consist of a network of filaments and the reproc bodies which they bear. These filaments are colourless green, and darkly coloured, but there is a gradual transitio the one to the other. The thin-walled colourless fil generally form a network in contact with the leaf, bu intermix with the thick-walled coloured filaments, and th or less colourless may gradually become coloured, wh coloured may produce a colourless portion. When furthe loped, however, the colourless and the coloured hyphæ are dis seen.

Mycelium.—At an early stage the surface of the leaf numerous more or less colourless hyphæ creeping over there are two kinds which may be distinguished—(a)

or elongated joints with mottled and usually vacuolated contents. The moniliform hyphæ averaged $3\frac{3}{4}$ μ in breadth, and the other, which were often of considerable length, $5\frac{1}{2}$ μ. Elongated and moniliform joints might occur in the same filament, but there were distinct, delicate, moniliform hyphæ and stouter hyphæ with elongated joints.

The dark coloured hyphæ are generally greenish-brown to dark brown, closely septate, either sparingly or copiously branched, thick-walled, bulging joints, often with oblique or longitudinal septa, $9\frac{1}{2}$-13 μ broad. The filaments often consist of several celled joints, and deeply constricted, so that their connection with each other is slight. The branches are very rigid, as may be seen when they are rolling about in a current, and the filaments anastomose as well as branch.

Reproductive bodies.—There is great variety in the mode of reproduction, and as this forms the distinguishing feature of the fungus it will be necessary to describe the different kinds with some fulness. The different forms are so unlike each other that the earlier mycologists assigned them to different form-genera, but they are now known to be stages in the life-cycle of the same fungus. The highest form or *Perithecium* will be described last, and this will enable us to fix the scientific position of the fungus.

(1) *Gonidia.*—These are produced in great abundance both by the colourless and coloured hyphæ, and no doubt contribute materially by their germination to weaving a web of hyphæ of firm texture. It will be convenient to consider them as produced by the colourless and coloured hyphæ.

(*a*) The gonidia produced by the colourless hyphæ at their tips are either colourless or pale green, and very varied. Some are in moniliform chains like a *Torula*, others spherical or oval and pale greenish, $7\frac{1}{2}$-13 × $3\frac{3}{4}$-$7\frac{1}{2}$ μ. Some are uniseptate and constricted at septa, 11-19 × $5\frac{1}{2}$-11 μ, others biseptate, about 24 × 8 μ.

A quadrate 4-celled body is very common, producing three radiating filaments, and bearing gonidia.

(*b*) The dark coloured hyphæ bear gonidia similarly coloured or a little paler, and are usually elliptical and uniseptate. These are very variable in size, $7\frac{1}{2}$-$16 \times 5\frac{1}{2}$-$8\frac{1}{2}\mu$. They are also in moniliform chains like a *Torula*, so that this form arises both from the transformation of the colourless and coloured filaments.

It has been shown by Zopf* that the ordinary joints of the dark coloured hyphæ are capable of germinating when detached.

(2) *Gemmæ.*—This is a convenient name for clusters of cells which detach themselves and reproduce the fungus. Detached portions of the coloured filaments, consisting of several joints and rounded at the ends, are very common. Also irregular groups of brown cells, which germinate and grow. Just as the genus-name of *Torula*, Pers., was applied to the moniliform chains of reproductive bodies, so the genus-name of *Coniothecium*, Corda, was given to the irregular groups of cells capable of germination. This form-genus would be represented both by the colourless quadrate bodies already referred to and the brown irregular clusters.

There are also green mulberry-like clusters of cells which are capable of germination and are really gemmæ, but they naturally belong to the next form.

It will readily be seen that between the *Torula* and *Coniothe-*

(3) *Glomeruli.*—I apply this term to pale or dirty green, or even brownish capsules, generally more or less spherical or hemispherical, and imbedded in and surrounded by the hyphæ. They are very common, and vary considerably in size from 75 to 470 μ in diameter. The surface is raised into minute rounded elevations, a structure easily accounted for on crushing and examination. They are often arranged in groups or in chains, and then they become somewhat polygonal from pressing against each other.

These capsules burst readily when ripe, and are found to consist of an outer green layer and inner colourless contents. The outer layer is composed of numerous clusters of green cells, each like a miniature mulberry, and measuring about 22 μ in diameter, hence the mammillated appearance of the surface. These clusters act like gemmæ and reproduce the disease on another Citrus-leaf, according to Penzig.* Inside this green shell are innumerable spherical, hyaline cells, large and small, imbedded in a gelatinous mass. They are either solitary or attached to each other by slender necks. The contents are turbid, with a relatively large vacuole, and while the larger are from 12-13 μ in diameter, the smaller are from 5-8 μ in diameter.

This has been assigned to the form-genus *Heterobotrys*, Sacc., and it is also found in connection with the "Sooty Mould" in Italy.

Penzig† describes and figures it as a stage in *Meliola penzigi*, Sacc., as a third conidial form, hitherto known as *H. paradoxa*, Sacc. It is interesting to observe that it is a different form of it we have in Australia, as the following account of the Italian form by Penzig will show (for the translation of which I am indebted to Dr. Gagliardi). He says:—"*H. paradoxa*, Sacc., appears to the naked eye as a small black globe, one-third of a millimetre in diameter, closely imitating the form of a perithecium. In fact, when we examine this small globe under the microscope, we can

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* Annali di Agricoltura, p. 322, 1887.
† *L.c.* p. 321, and Atlas Pl. XXIV. fig. 4.

distinguish a parietal and a central part; but the parietal is not a solid structure, parenchymatous, as it consists of a number of dark coloured glomerules, just like those described as belonging to the second conidial form. In the centre of this pseudo-perithecium we find innumerable spherical cellules, large, discoloured, with delicate walls, and one or two small guttules in the interior, isolated or united by a very narrow ligature. The peripheral glomerules, as well as the central cellules, may reproduce, on germination, the 'morfea' on another leaf of a Citrus-plant. This is rather an economical form of reproductive-body, since the capsule itself, as well as its contents, is utilised in this way.

The Heterobotrys-stage is found both in Italy and Australia with differences in detail, and it is conclusively proved, chiefly from the New South Wales specimens, that it is derived from the colourless or pale green filaments of the fungus. The coloured hyphæ give rise to several other reproductive bodies, which are generally recognised as of three kinds—Spermogonia, Pycnidia and Perithecia—but when a number of specimens are examined it is not always easy to assign the forms met with to these three categories. In the present instance, if we compare the forms with those of allied and known species such as *Capnodium salicinum*, Mort., there is no difficulty with the perithecia from their containing Asci, nor with the regular pycnidia and their septa

One of these three will be regarded as a spermogonium and the other two as gonidial receptacles or pycnidia, so that there will be three forms of pycnidia distinguished—(1) what may be called the *Antennaria-form*, with colourless, oval, unicellular spores; (2) the *Cerato-pycnidial-form*, with colourless, rod-like, unicellular spores; and (3) the *Pycnidial-form* proper, with coloured, pluricellular pycnospores.

(4) *Spermogonia.*—The so-called spermogonia with spermatia occur in great abundance along with the other forms. They were so named by Tulasne, but as no male sexual function has been demonstrated here, the name is a misnomer, but it may be retained for distinction' sake. De Bary, however, considers spermatia to be non-germinating gonidia, and that might serve to distinguish them.

The spermogonia are dark coloured bodies, usually green by transmitted light, oblong, ovate or oval in shape, rounded and smooth at the free end, with irregularly netted surface. They vary in size from 62-190 by 37-77μ.

The spermatia are hyaline, rod-like, minute, 4-5½ × 1-1½ μ.

(5) *Antennaria.*—These are dark green or brownish bodies, variable in shape and size, which may be swollen and flask shaped, with a short neck, or elongated oval or hemispherical, and opening irregularly at the apex. The contained spores are quite distinct from those of any of the other reproductive bodies, and I have utilised the genus-name of Antennaria, which is now generally regarded as a stage in the development of *Capnodium*. They are generally in clusters, dark green in colour, with decidedly marked walls, from 75-122 by 70-112 μ. Sometimes they are about as broad as long.

The spores are hyaline, oval to ovate, with granular contents and 2-5-guttulate, imbedded in mucilage, 5½-6½ × 2½-5 μ, average 5½ × 4 μ. Their size, shape and nature of contents distinguish them from the spermatia.

(6) *Cerato-pycnidia.*—I use this name for pale green, greenish-brown to dark brown, often swollen and curved, irregularly

shaped and sometimes branching pycnidia. They are distinct in appearance and contents from the two preceding forms, and may be very common.

They are so varied in character that it is difficult to describe them generally, but a special form may be selected, as in fig. 6*a*. It is an elongated, irregularly shaped body, the lower three-fourths of a pale green colour with a tinge of yellow, and the upper fourth of a decidedly darker tint. The upper fourth is slightly swollen and tapering towards the free end, with a round opening at the very apex, and contains the spores.

The lower portion tapers towards the base and bulges on one side towards the centre, after which it narrows into the upper portion. It is enveloped by and has hyphæ growing out from it, while the upper fourth is bare. The wall is faintly marked out into small irregular areas. The size is 240×75 μ, and the terminal smooth portion is 66×56 μ. There is no decided line of distinction between the upper and the lower portion, only the darker colour is confined to the upper portion.

Other specimens are common enough, which are just straight or curved cylindrical bodies, branched or unbranched, sometimes swollen at the base, and generally becoming paler in colour towards the tip. They may reach a length of 530 μ, and narrow down to a breadth between 20-30 μ. The wall is evidently com-

[redacted]

gradually tapering towards mouth, or swollen just below the opening. It may also be of a bright leek-green or greenish-brown or dark brown. The hairs fringing the mouth are simply tapering continuations of the cells of the walls, which are hyaline instead of being coloured. The pycnidia are sometimes very long, attaining a length of 670 μ.

The pycnospores are olive-green, pale yellowish-brown or ellowish. They are also colourless, but probably they pass from olourless to green, then to brown on maturity, like the sporidia. hey are ovate to oval, or even cylindrical, generally 3- (sometimes or 4-) septate, slightly constricted at the septa, and sometimes ongitudinally divided, 15-22½ × 5½-9½ μ, average about 19-20 × ½ μ. As already noticed, one branch may produce spermatia nd the other pycnospores. I have observed no connection etween spermogonia and pycnidia in their contents, but between e spermatia and the spores of cerato-pycnidia there is a close greement.

(8) *Perithecia.*—They occur in large numbers at various stages development, but none were found naturally opened. They e upright and deeply imbedded in the coloured hyphæ, so that eir black-looking, rounded, upper portion is only distinctly en. When crushed, the thick tough wall, as seen by transitted light, is regularly of a characteristic sea-green or sageeen colour, and with a decided net-like surface.

They are oblong to oval or variously shaped, smooth in the pper portion, but often with adhering hyphæ in the imbedded ortion, and varying in size from 112-250 × 52-112 μ.

The asci are hyaline, cylindrical-clavate in shape, sub-sessile, ith rounded apex, 8- 6- 4-spored, and ranging from 49-81 × 15-20μ. he fully mature asci average 70-80 × 19-20 μ.

The sporidia when mature are brown, oblong, sometimes a ttle fusoid, generally obtuse at both ends, constricted about the iddle, 5-6-septate, often with longitudinal or oblique septa, rranged mostly in two ranks, but occasionally in three, and veraging 21-24 × 8½-9½ μ.

The paraphyses are hyaline, elongated-clavate, usually wi finely granular contents, same length as ascus and $9\frac{1}{2}$ μ. i broadest part.

The asci and paraphyses arise alongside of each other fro short chains of colourless cells.

Asci were met with in various stages of development, and th sporidia pass through different coloured stages. At first th contents of the ascus are finely granular, almost complete filling the interior and having a small oval nucleus towards th centre. Then the differentiation of this homogeneous mass int colourless sporidia takes place. As they grow they assume very pale green tint, and finally become brown, while they n longer fill the ascus, as the space between the topmost sporidiu and the outer wall of the ascus may be $9\frac{1}{2}$ μ.

It is worthy of note that these changes of colour from hyalin to *green* and from green to brown in the course of developmen of the sporidia may turn out to be characteristic features of th genus *Capnodium*. At any rate in the closely allied genu *Meliola* I found the sporidia to pass from hyaline to *yellow*, an from yellow to brown;* and in *Pleospora herbarum*, Pers., the are first hyaline, then yellowish, and finally yellowish-brown.†

Only a few mature sporidia were found, and as none of th perithecia met with had opened they are probably ripe as a whol

which are often branched, and usually opening at the apex with a large fringed orifice. These are seated upon and amongst a dense subiculum of closely jointed or moniliform black hyphæ, so as to form large velvety patches, and are possibly, in some instances, the more complete developments of mould belonging to the genus *Fumago*." The accompanying figure of *Capnodium elongatum*, B. & D., with the spores leaves no doubt as to the pycnidium being meant. The pycnospores have a certain resemblance to the sporidia, but the latter have more septa, and of course are contained in asci (figs. 1-12).

Armadale Specimens.—Abundant examples were met with in my own garden, but only immature forms of perithecia were found. One side of the solitary orange-tree was decidedly less attacked than the other, and it was the most exposed and that which received most of the sun, the sheltered side receiving less of the sun being by far the worst.

Colourless and coloured hyphæ similar to the preceding were met with, and gonidia, gemmæ, glomeruli and antennaria forms.

Mycelium and Gonidia.—On the surface of a leaf only slightly attacked, numerous colourless to pale green creeping hyphæ were found, very irregular in outline, with very few septa and averaging $3\frac{1}{2}\,\mu$ in diameter. Also numerous similarly coloured, oval to elliptic, continuous or uniseptate, and slightly constricted gonidia. The colourless hyphæ were generally branched, septate, thin-walled, and either with elongated or moniliform joints, and the gonidia were continuous, uni- or bi-septate. The dark coloured hyphæ were generally closely septate and constricted at septa, branched, thick-walled, and stouter than the colourless. The gonidia were usually uniseptate or in moniliform chains.

Gemmæ.—The colourless and dark brown clusters of cells were met with germinating, also the mulberry-like clusters of green cells.

Glomeruli.—These were in great abundance, and showed the green clusters of cells composing the wall, and the large and small colourless cells inside imbedded in mucilage, and often connected by an isthmus.

Antennaria-forms.—These were associated with the glo
and seemed to be the most plentiful of all. They were im
in clusters among the hyphæ and emitted the colourless sp
great abundance, which remained in masses around the irreg
opening mouth.

No pycnidia were met with, although carefully looked
a large number of leaves.

Perithecia.—Only immature forms were found of variou
and at different stages of development. The only one f
(fig. 21) was of fair size ($150 \times 112\ \mu$) dark coloured and o
shape. On pressure the net-like areas of the wall wer
distinct, and by transmitted light were either sea-green to
green or brownish. It contained numerous oil-globules
few asci with paraphyses. The immature asci were short
narrower than the average ($39 \times 9\frac{1}{2}\ \mu$) and showed finely gr
colourless contents within an inner envelope, and there
small oval spot towards the centre. In some cases division
contents had begun, and probably there were some mature
of perithecia, but I did not happen to come across them
13-21).

Kew Specimens.—The specimens from Kew did not show
advanced stages. There were colourless to pale green h
bearing their unicellular or bicellular or simple gonidia, tog

ordinary colourless and coloured hyphæ, together with glomeruli, and pycnidia (principally pycnidia), were in great abundance, and seemed to be the prevailing form. There were also immature forms of perithecia, but not as yet in great quantity. The pycnidia varied in colour from leek-green when unopened to yellowish-brown when opened, and the specimen figured (fig. 28) was 526 x 122 μ. The pycnospores were generally pale green in colour, but sometimes brownish, and the average size was 19 x 8 μ. (figs. 26-30).

Other Victorian Specimens.—A few other specimens were obtained from Brighton and Elsternwick, suburbs of Melbourne.

The Brighton specimens were particularly rich in cerato-pycnidia and the antennaria (figs. 31-35), while the Elsternwick specimens showed abundance of pycnidia (figs. 36-37).

South Australian Specimen.

An orange-leaf was forwarded by Mr. Quinn, Inspector under the Vine and Fruit Diseases Act, with the "Sooty Mould" upon it, but not very largely developed.

There were the colourless and coloured hyphæ, gonidia and gemmæ and abundance of glomeruli. The colourless hyphæ were septate, branched, with moniliform or elongated joints, and averaging $3\frac{1}{2}$-$4\frac{1}{2}$ μ broad.

The brown hyphæ were septate, sparingly branched, and varied in breadth from $4\frac{1}{2}$-$7\frac{1}{2}$ μ.

The gonidia were similarly coloured and usually simple.

The gemmæ were either clusters of dark brown cells or the green mulberry masses derived from the glomerules. None of the colourless quadrate bodies were met with.

The glomeruli were usually of a yellowish-green to pale green colour, and either isolated or in group.

The presence of brown gemmæ and glomeruli was the predominating feature (figs 38-39).

New South Wales Specimens.

The specimens sent through the courtesy of Mr. Maiden, Govt. Botanist, from trees in the Botanic Gardens, Sydney, were badly

infested with scale, but very little of the "sooty mould." There was also upon the scale a considerable quantity of a parasitic fungus known as *Microcera coccophila*, Desm.

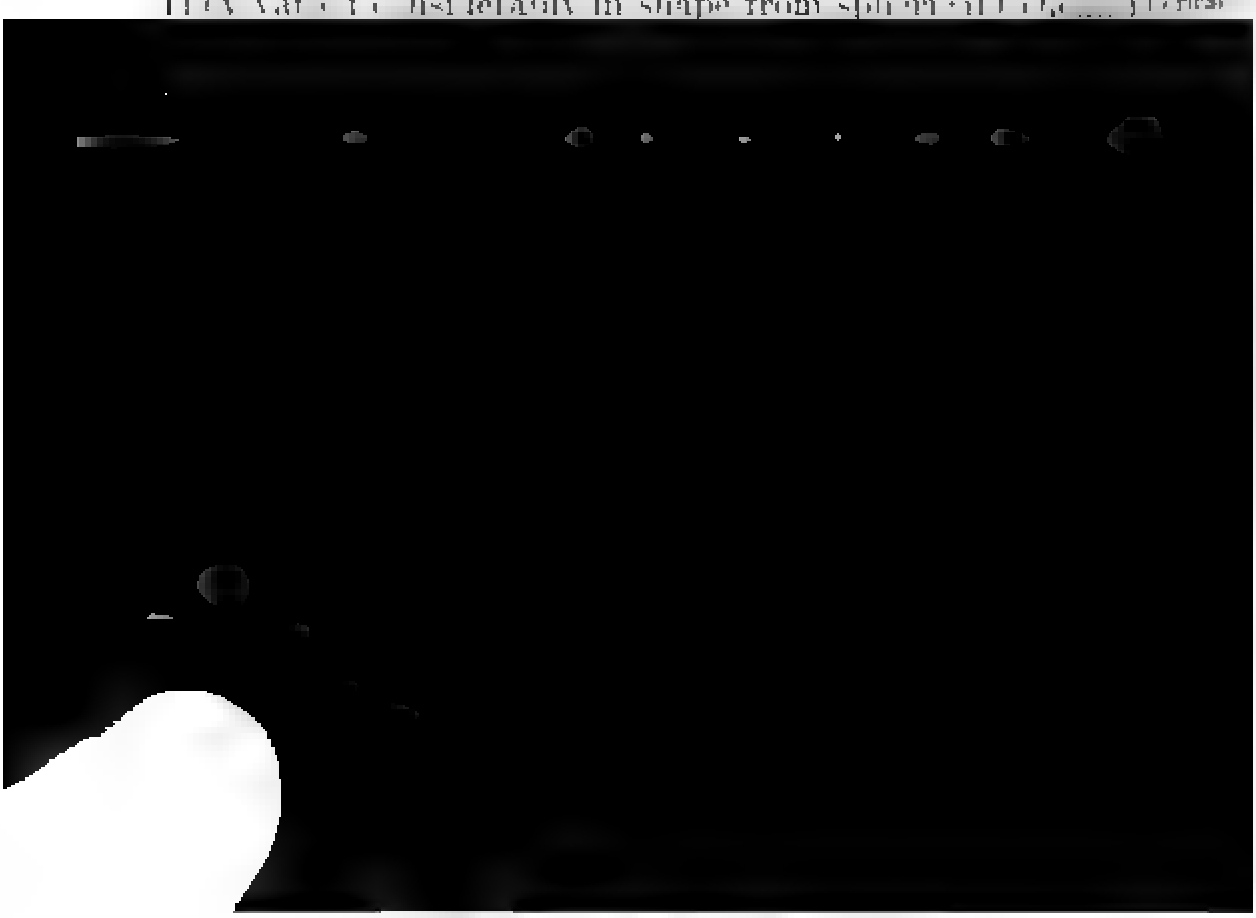
In some cases on the upper surface of the leaf there was a very thin stratum of a mud colour, of just sufficient consistency to hold together when peeled off, but no more. It was evidently largely composed of fine dust, and scattered over it were little dark punctiform bodies, very variable in size when looked at with a magnifying glass.

Under the microscope it was seen to consist of a network of colourless hyphæ, and numbers of the spherical or irregularly shaped bodies we have already called glomeruli.

There were very few traces of the greenish-brown hyphæ developed, as the dust had evidently kept the fungus in check.

The colourless or very pale green hyphæ were closely septate, copiously branched and densely crowded so as to form a pavement of cells. The hyphæ were either moniliform or with longer or shorter joints, and bore various gonidia. The diameter of the hyphæ varied considerably, but the broadest was from 6-7½ μ, and narrowest about 4 μ.

The glomeruli were exceedingly numerous, scattered or in clumps, and were yellowish green to pallid or even brownish. They varied considerably in shape from spherical to [illegible]



And of the special reproductive bodies, the glomeruli originate from the colourless hyphæ, appearing in abundance when no other is present. Even when the brown filaments are formed, the glomeruli are seen to be surrounded and not produced by them, as they leave a perfect cavity among the filaments, with the clear colourless layer at its base.

The remaining reproductive bodies are formed from the oloured hyphæ, and apparently appear in the following order hen not developed simultaneously :—spermogonia, antennaria, erato-pycnidia, pycnidia and perithecia.

This specimen served a very useful purpose in determining the rigin of the coloured from the colourless hyphæ. At first othing was observed but colourless hyphæ and numerous lomeruli, and from the constancy of this appearance I was nclined to the opinion that the colourless hyphæ with their eproductive bodies formed an independent fungus, afterwards verlaid by another fungus. But on further search, I found oloured hyphæ arising from the continuation of the colourless yphæ, and thus the connection was established (figs. 40-44).

General development of sporidia.—Taking an ascus in the young ondition and when only about half the size of the adult form, it s found to be filled with finely granular protoplasm, only the hort stalk being without it, and there is a minute, slightly oval rimary nucleus in the centre (fig. 21).

When further grown the protoplasm recedes from the top, nveloped in its own membrane, and gradually gets further and urther away, until in the mature form it may be 9 μ from the op of the ascus. It divides meanwhile into the sporidia, which oon acquire a distinct outline and a few septa. There is usually slightly knobbed pedicel projecting from the top of the topmost poridium when immature, apparently indicating a contracted ortion of the protoplasmic membrane (fig. 12).

The contents of the at first colourless sporidia soon change nto a pale green, increase in size and develop more septa (fig. 10). This colour next changes to greenish-brown and finally a decided ark-brown like the mycelium, which is the mature form (fig. 12).

Alongside of each other in the same perithecium the three different coloured stages may be seen, but the sporidia in any individual ascus are all of the same colour.

When treated with potassium-iodide-iodine, the contents of the colourless sporidia immediately assumed a beautiful bright canary-yellow tint, but the rest of the ascus remained perfectly hyaline, showing that the epiplasm or glycogen-mass is not present as in Discomycetes, which gives a reddish- or violet-brown reaction. The green and the brown coloured sporidia were unaffected by this reagent. The contents of the paraphyses were also coloured bright canary-yellow, suggestive of their being simply sterile asci. The number of sporidia in each ascus is typically 8, but 4, 5 and 6 were also met with.

Characteristic Distinctions of the Special Reproductive Bodies.

1. *Glomeruli.*—They are generally of a dirty green colour, but may be pallid or greyish, or even brownish, apparently by coating of dust, &c., and are more or less spherical or hemispherical in shape. They always originate from the colourless or pale green hyphæ, and are the first-formed of the special reproductive bodies. The covering is composed of clusters of mulberry-like green cells and some of the hyaline cells in the interior are connected with

3. *Antennaria.*—The spores here are the characteristic feature. They are simple, oval to ovate, with granular contents, and usually pedunculate, so that they are distinct from any of the others. The glomeruli are too variable in shape and size to be relied on for distinction, and they have a net-like surface like the preceding form, but they are often borne laterally on a filament.

4. *Cerato-pycnidia.*—When fully developed they are distinguished from the preceding forms by being very much elongated and often branched, and the regular pattern of their walls; and from the pycnidia proper by the naked, round or oval mouth-opening, but mainly by their contents. The simple, hyaline, rod-like minute spores distinguish the two forms at once.

5. *Pycnidia.*—The pycnidia proper, as already indicated, are distinguished by their usually fringed mouth-opening and the coloured tri-septate pycnospores.

6. *Perithecia.*—The perithecia are distinguished from all the others by containing asci accompanied by paraphyses. They sometimes closely resemble spermogonia, although I was generally able to distinguish them by their sea-green or sage-green colour. However, with the exception of the glomeruli, the various reproductive bodies are so variable in size, shape and colour, that the nature of the contents must always be relied upon for final determination.

Connection with scale or other insects.—It is generally believed that this fungus is a saprophyte, since it does not penetrate the leaf in any way, and consequently does not extract nourishment from it. It must live at the expense of something else, and this is supposed to be the honey-dew secreted by certain insects, and associated with which it is invariably found. As a matter of fact I have never found "Sooty Mould" without the accompaniment of scale insects, and they secrete a sweet fluid known as honey-dew. Maskell, in his work on New Zealand Scale Insects, writes:—"In many cases they exude, in the form of minute globules, a whitish, thick, gummy secretion, answering probably to the 'honey-dew' of the Aphididæ. This secretion drops from them on to the plant, and from it grows a black fungus, which soon

the leaf may be variously accounted for. The upp
most readily moistened; the rain and dew are longer re
channel over the midrib at the tip. But the main reas
is that the honey-dew is dropped there by the cocci
found on the under surface of the leaves. In the
honey-dew the fungus might grow on the accumula
excreta of insects, &c., but the general rule is that
follows in the wake of insects, and to get rid of the o
also get rid of the other.

Since writing the above I have received a note fr
Tepper, F.L.S., Adelaide, in which he shows how the
of honey-eating birds may affect the prevalence of
He says:—"Regarding the 'Sooty Mould' and its
now in many localities, it may be mentioned that it
have been practically absent, when nature was less
by man, and for a very simple reason. It being due t
exudations of scale insects, &c., coating the trees, its
depends upon that of its producers, and this upon t
of the sugar-loving, brush-tongued parakeets and
which formerly abounded so greatly. These I have of
myself busy in the *early morning* among the foliage
upon which the honey-dew appeared. Later in the
occupied these in overwhelming numbers, and dro
away, protecting the insects and cleaning the foliage.

"Now many plants have developed special *organ*
the ants as protectors against birds and animals whi

aphides, &c., to secure indirectly the protective services of the ants, wherever there were birds, &c., available to keep the former under control within safe limits. Therefore the reduction of the birds, &c., by man, stimulated the limitless increase of the scales, aphides, psyllids, aleurodids, &c., and at the same time also the numbers of the ants, which helped to clean away the exudations of those of their pets left by the birds, &c., were greatly diminished. Hence excess of honey-dew insects and of their produce, which is naturally availed of by the low fungoid germ which, under normal conditions, had to be satisfied with the 'crumbs' left by the higher agents"

There is here a somewhat complex relation between the different forms of life used by the plant for protective purposes, and if one of the checks is withdrawn or diminished, the balance is disturbed and disorder ensues.

1. The *Scale* or other insects are used indirectly to attract the ants by their sweet secretions.

2. The *Ants* like a standing army protect the foliage against the attacks of leaf-eating animals.

3. The abundance of honey-eating *Birds* is necessary to keep the scale or other insects within reasonable bounds.

4. The reduction of these birds by man tends to favour the increase of the scale insects and their produce

5. The scale and other insects now get the upper hand, and the ants protecting the insects also favour their increase.

6. The consequence is superabundance of honey-dew, and this is taken advantage of by the germs of the fungus to spread and multiply.

Thus the destruction of the honey-eating birds has brought about an increase of the honey-dew and of the "Sooty Mould" which lives upon it, so that it is not only insectivorous birds which ought to be protected for the benefit of the grower.

It is interesting to observe the appearance of other checks to the spread of the scale or other insects. Here there are two parasitic fungi found respectively on the red and the white orange scale, *Microcera coccophila*, Desm., and *M. rectispora*, Cooke. In

Florida *Aschersonia tahitensis*, Mont., has been found attacking and destroying the larvæ and pupæ of the "Mealy Wing" (*Aleyrodes citri*, R. and H.), and bids fair to be of great use in combating the pest. This latter fungus has also been met with in Queensland on the foliage of a large climber, but no mention is made of its connection with scale or other insects.

Effect on trees.—This fungus does not produce any marked injury to the tree at first, as when the "sooty mould" is removed from a leaf the surface beneath is often as green and glossy as a healthy one. The injury is rather of a mechanical nature, and, combined with the scale insects sucking the juices of the plant, there is often considerable damage done. The fungus will interfere with the process of assimilation, by preventing the access of light and the escape of watery vapour and other gases. Indirectly this will hinder the growth of the tree and affect the production of bloom and of fruit. The leaves are less able to stand the effects of drought or other unfavourable conditions, and if the young fruit is attacked by it its development is hindered and it generally remains insipid.

Treatment.—It will be evident from the preceding remarks that the only sensible treatment will be to get rid of the lion's provider; and whatever insect provides the pabulum for the fungus to flourish on, should be dealt with. Mr. French, the Government

of scale insects, and so I have written a short paper upon this particular form. (*Vide* Appendix, p. 498.)

The fungus itself might be directly treated, but the only sure way is to get rid of the cause of the trouble, viz., the insects.

The following is the formula recommended for the resin wash:—

Resin	... 20	lbs.
Caustic soda (98%)	... 4¼	„
Fish oil (crude) ...	... 3	pints
Water to make ...	... 15	gallons.

This is a stock preparation, and when required for use one part thoroughly stirred is added to nine parts of water.

Scientific Description.

CAPNODIUM CITRICOLUM, n.sp.—**Citrus Capnodium.**

Forming black soot-like incrustations, peeling off as a thin membrane, often covering entire surface of leaf. Colourless or pale green hyphæ creeping, copiously branched, septate, up to 6-8¼ μ. broad, intertwining and forming a pavement of cells, giving rise to ascending, short, simple, septate branches, bearing colourless or pale green gonidia, continuous, uni- or bi- septate, spherical, oval or elliptical, slightly constricted, smaller 7½-9½ × 4-5¼ μ, larger 11-24 × 5½-11 μ; or in moniliform chains.

Coloured hyphæ greenish-brown to dark brown, closely septate, deeply or slightly constricted, sparingly or copiously branched, rigid, 9½-11 μ broad, bearing similarly coloured gonidia, usually elliptical, uniseptate, 7½-16 × 5½-8½ μ.

Perithecia intermixed with spermogonia, antennaria, cerato-pycnidia and pycnidia, sea-green to sage-green appearing black, oblong to oval or variously shaped, rounded and smooth at free end, with net-like surface, 112-250 × 52-112μ.

Asci cylindrical-clavate; sub-sessile, apex rounded, 8- 6- or 4-spored, 70-80 × 19-20 μ.

Sporidia brown, oblong, sometimes a little fusoid, generally obtuse at both ends, constricted about the middle, 5-6- septate, often with longitudinal or oblique septa, arranged mostly in two ranks but occasionally in three, averaging 21-24 × 8½-9½ μ.

Paraphyses hyaline or finely granular, elongated-clavate, as long as asci and $9\frac{1}{2}$ μ broad towards apex.

Torula-, Coniothecium-, and Heterobotrys-stages occur.

On living leaves of orange and lemon, particularly on upper surface, also on branches and fruit; all the year round. Victoria, New South Wales, South Australia, Queensland.

There has been a considerable difference, and I might even say change of opinion, as to the true nature and scientific position of the fungus causing the "sooty mould" on Citrus trees. Probably it is due to different fungi in different countries; but as far as I have examined specimens in Australia, they all seem to be referable to the same fungus. Now what is this fungus? Having obtained the various stages of it and abundance of the highest or perithecial stage, there is plenty of material for coming to a definite conclusion.

Meliola penzigi, Sacc., is now recognised as the common "sooty mould" in Europe and America, but the globular perithecia, and the hyaline to brown sporidia $11\text{-}12 \times 4\text{-}5$ μ, distinguish it.

Meliola citri, Sacc., causes the disease known in Italy as "mal di cenere," on account of the ashy-grey crust formed by it; but apart from that, the bay-brown perithecia and hyaline sporidia do not agree with this one.

[illegible], Sacc., has also been found on the leaves and

oid, ⅓ mm. high, and spermatia as 7 μ long. As no asci nd, it is doubtful if the bodies referred to were really ı, but the 2-3-septate sporidia of Thuemen are very from the 5-6-septate sporidia of the present form.

'ium salicinum, Mont., has been determined by Farlow leaves in America, and there is considerable resemblance points, but the asci and sporidia show marked distinc- he asci measure 40-45 x 24 μ, while here they are on an '0-80 x 19-20 μ, or nearly double the length. Then the orrespond well in size in both cases, but instead of being ɜ here, they are 5-6-septate.

tly, although the "sooty mould" is so common in Aus- erever Citrus fruits are cultivated, it has not yet been lly determined, and I propose naming it *Capnodium* ı.

ɪrphism.—Polymorphism literally means many forms, əference to the various forms assumed by fungi, especially eproductive bodies, in the course of their development. hange of form may be accompanied by a change of host, is distinguished as heterœcism, or there may even be a of the host, and then it is termed lipoxeny. The change referred to here occurs consecutively or simultaneously me individual, and all the changes were found even on ortion of the same leaf.

present instance there are two different kinds of hyphæ

Detached portions of the hyphæ in both are able
the fungus, but that need not be specially considere

The starting point is with the colourless hyp
gonidia, gemmæ and glomerules; and the final stag
coloured hyphæ producing perithecia. The various
bodies of both the colourless and the coloured hyph
respectively in close contiguity, leaving no doub
genetic connection, and the real point at issue is, d
hyphæ grow out of the colourless, or is it simply a c
tion? Fortunately, in the specimens from New Sou
hyphæ were nearly all colourless or pale green, an
very occasionally that a brownish filament was see
in some instances, the pale green or colourless funda
with projecting colourless filaments was observed
pass into a pale brown shade, and from these cells
and comparatively thick-walled hyphæ arose. So th
less hyphæ may pass into the coloured, and sinc
reproductive bodies may arise from the same or adj
there is genetic connection and not merely associatio
the different stages of this fungus. The forms as
different reproductive bodies are very varied and
general description, so that I have drawn a nu
different shapes in order to give some idea of
wealth of variety occurring among them. Besides
specially examined this fungus during the winter

(5) Cerato-pycnidial stage; (6) Pycnidial stage; and (7) Perithecial stage.

My best thanks are due to all those who kindly supplied me with specimens for this investigation, viz.:—Messrs. Carson, Kew; Hunt, Elsternwick; Maiden, Sydney; Neilson, Burnley; Quinn, Adelaide; Turner, Brighton; and Williams, Doncaster.

EXPLANATION OF FIGURES.

(All the figures are magnified 1000 diameters unless otherwise indicated.)

PLATE XXIII., FIGS. 1 *a-b*; FIG. 2; FIGS. 3 *a-g*; FIGS. 4 *a-d*.

Doncaster specimens—

Fig. 1.—Colourless hyphæ and gonidia.

Fig. 2.—Colourless quadrate gemma with three radiating hyphæ and bearing gonidia.

Fig. 3.—Coloured hyphæ, moniliform and otherwise, bearing gonidia (fig. *c* × 540).

PLATE XXIV., FIGS. 4 *e-g*; FIGS. 5 *a-c*; FIGS. 6 *a-o*.

Fig. 4.—Spermogonia with spermatia and pattern of wall (fig. *a* × 540; figs. *b* and *e* × 145; fig. *f* × 540).

Fig. 5.—Antennaria-form with spores and pattern of wall (fig. *a* × 270).

PLATE XXV., FIGS. 6 *p-r*; FIGS. 7 *a-h*.

Fig. 6.—Various forms of cerato-pycnidia with spores; the origin is shown in two instances from basal cells (fig. *a* × 270; fig. *c* × 540; fig. *e* × 540; figs. *g-h* × 270; figs. *i-m* × 145; fig. *n* × 270; fig. *o* × 145; fig. *p* × 145; fig. *q* × 270).

Fig. 7.—Various forms of pycnidia, showing in some cases fringed opening (figs. *a-d* and *f-h* × 145; fig. *e* × 270).

PLATE XXVI., FIG. 8; FIGS. 9 *a-g*.

Fig. 8.—Various forms of pycnospores—mature and immature; two colourless forms at upper right-hand with finely granular contents.

Fig. 9.—Various forms of perithecia, some of them just peeping out from mass of hyphæ; and pattern of wall (figs. *a*, *c*, *f*, and *g* × 540; fig. *b* × 270; figs. *d* and *e* × 145).

PLATE XXVII., FIGS. 10 *a-d* ; FIGS. 11 *a-b* ; FIGS. 12 *a-f*.

Fig. 10.—Asci with paraphyses, one with basal cell to left (figs. *a-d* × 54

Fig. 11.—Two sporidia detached.

Fig. 12.—Asci containing 4-8 sporidia; the first contained colourl sporidia, the next two pale green sporidia, and the remain were brown and mature, only the last one of the group bei colourless: paraphysis (fig. *f*) also shown.

PLATE XXVIII., FIGS. 13 *a-p*.

Armadale specimens—

Fig. 13.—Colourless hyphæ showing their varied forms, together w gonidia, continuous or 1- to 2-septate (figs. *d* and *n* × 540).

PLATE XXIX., FIGS. 14 *a-b*; FIGS. 15 *a-m* ; FIG. 16 ; FIGS. 17 *a-b* ; FIGS. 18 *a*

Fig. 14.—Quadrate colourless gemmæ (fig. *b* × 540).

Fig. 15.—Various forms of coloured hyphæ and gonidia (fig. *a* × 540).

Fig. 16.—Greenish-brown cluster of cells germinating.

Fig. 17.—Mulberry-like gemmæ.

Fig. 18.—Spores isolated and connected, large and small.

PLATE XXX., FIGS. 19 *a-l* ; FIG. 20; FIGS. 21 *a-c* ; FIGS. 22 *a-i*.

Fig. 19.—Antennaria-forms with spores and portion of netted wall (fi *a-d* × 540 ; figs. *e-i* and *k* × 270).

Fig. 20.—Immature form of antennaria (× 540).

Fig. 21.—Immature perithecium (fig. *a* × 145) and asci, showing origi

Fig. 29.—Wall of pycnidium formed of elongated, filamentous cells (fig. *a* near the top; fig. *b* lower down).

Fig. 30.—Green filaments of walls passing into colourless fringe at mouth.

Brighton specimens—

Fig. 31.—Quadrate gemmæ (× 540).

PLATE XXXII., FIGS. 32 *a-b*; FIGS. 33 *a-g*; FIG. 34; FIGS. 35 *a-b*.

Fig. 32.-Antennaria (× 145) and spores.

Fig. 33.—Cerato-pycnidia and spores (figs. *a*, *b*, *d*, and *e* × 145; figs. *c*, *f*, and *g* × 270).

Fig. 34.—Cerato-pycnidium conical and bullet-shaped (× 540).

Fig. 35.—Elongated jointed filaments composing wall of cerato-pycnidium, sometimes long and slender, sometimes short and stout.

Elsternwick specimens—

Fig. 36.—Quadrate gemma (× 540).

Fig. 37.—Upper portion of pycnidium and pycnospores (× 540).

South Australian specimens—

Fig. 38.—Dark brown gemmæ (figs. *b* and *c* × 540).

Fig. 39.—Glomeruli (× 145).

PLATE XXXIII., FIGS. 40 *a-d*; FIG. 41; FIGS. 42 *a-b*; FIGS. 43 *a-b*.

New South Wales specimens—

Fig. 40.—Branching and gonidia-bearing colourless hyphæ.

Fig. 41.—Colourless and coloured cells and hyphæ. The colourless gradually pass into the pale brown towards the right, and produce thick-walled hyphæ, shown darker in colour.

Fig. 42.—Quadrate gemmæ (× 540).

Fig. 43.—Glomeruli, in chains and in groups (fig. *a* × 145; fig. *b* × 52).

PLATE XXXIV. (upper division of Plate), FIGS. 44 *a-h*.

Fig. 44.—Outlines of various isolated glomeruli (fig. *g* × 145).

Note.—The following are the magnifications assigned to Zeiss's Oculars and Objectives:—

Oc.	2.	Obj.	A = 52.
,,	4.	,,	A = 97.
,,	2.	,,	C = 145.
,,	4.	,,	C = 270.
,,	2.	,,	F = 540.
,,	4.	,,	F = 1000.

APPENDIX.

MICROCERA COCCOPHILA, Desm.—Coccus-loving Microc

(Plate XXXIV., lower division of Plate.)

Minute, deep brick-red tubercles, rounded or flatten disc-like on surface, usually in small groups, visible to the eye, hard and horny when dry, with short stem-like base.

Hyphæ at base of gonidiophores hyaline, septate, close pacted, 3-4 μ broad.

Gonidiophores tufted, filiform, elongated (at least 280μ), sometimes slightly constricted at septa, rose-pink in mas finely granular, and often vacuolated contents, 4-4½ μ broa

Gonidia same colour as gonidiophores to hyaline, curve gated, usually blunter at free end than attached end, witl granular, nucleated contents, variously septate, continuou 8-septate, average 5-6, size from tip to tip of curve and not length 75-103 × 5½-8½ μ.

So far it has not been met with in Victoria, but I hope to test its efficacy on the Orange Scale shortly,

It is closely allied to *Fusarium*, but the small tubercles differ and it is believed to be a conidial condition of *Sphaerostilbe*.

EXPLANATION OF FIGURES.

Microcera coccophila, Desm.

Fig. 1.—Gonidiophores and gonidia (× 527).

Fig. 2.—Gonidia with from 3-8 septa (× 1000).

NOTES AND EXHIBITS.

Mr. Henn exhibited a collection of 43 species of Mollus th· Family *Rissoiidæ*, collected by himself in Port Jackson. following, which are found also in Tasmania, are now for the time recorded from Port Jackson:—*Rissoina elongata*, Pet *R. Badia*, Petterd; *R. spirata*, Sowerby; *R elegantula*, A *Rissoia cyclostoma*, Ten.-Woods; *R. Maccoyi*, Ten.-Woods *Petterdi*, Brazier (= *pulchella*, Petterd). No less than six species are apparently new; and Mr. Henn promised a p dealing with them at a future date, after he had compared t with the Rissoiidæ of the neighbouring colonies. He exhibited specimens of *Stylifer Lodderæ*, Petterd, and *Ham cymbalum*, Q. and G., found by Mrs. Henn at Long Ba October, 1893; *Turbonilla erubescens*, Tate; *Crosseia labiata*, Woods; and *Zeidora Tasmanica*, Ten.-Woods, found by hi in shell sand at Middle Harbour, all previously unrecorded New South Wales.

Mr. Edgar R. Waite contributed the following note on

The Range of the Platypus.

correspondents detail habitats further north than has been previously recorded, others give occurrences within the latitude above quoted, but at the same time supply localities whence the Platypus was not previously known. Such letters, together with information privately received, are therefore also reproduced, and I have inserted, within brackets, the latitude of the localities recorded.

The latitude of Trinity Bay (16° 45′ S.) is the most northern limit of which I have record, and is supplied by two independent correspondents as follows:—

(1) "There are plenty of Platypi along from Mareeba to Kuranda in the Barron River, which runs into Trinity Bay north of the 27th [misprint for 17th] parallel. There's even a creek here named Platypus Creek.—*R. W.H., Cairns.*"

(2) "The Platypus certainly lives a long way north of the Tropic of Capricorn. Years ago they were plentiful in the Barron (16° 45′ S.) just above the falls, and I believe they can be found right along the North Queensland coast. I have seen them both in the Herbert (18° 33′ S.) and Burdekin (19° 45′ S.) and their tributaries, but mostly above the range. On one occasion I saw one killed in Gowrie Creek, Lower Herbert District, where alligators [*Crocodilus porosus*] are quite plentiful. —*O K., Ravenswood.*"

Three other habitats are given below, which although further south than the Barron River, are yet a long way north of the 18th parallel. One of these observations (No. 3) is peculiarly interesting, as it extends the range into the Gulf of Carpentaria, at a point very much further west (140° 56′ E.) than any previous record from Northern Australia, and is thus the most north-westerly habitat at present known.

(3) "I have myself shot Platypi at Herberton (17° 25′ S.), and have met a Mr. Walcott, of Tenterfield, who has two Platypi shot or trapped in the Norman River, Normanton (17° 28′ S., 140° 56′ E.). While Normanton is no further north than Herberton, the above goes to show that the Platypus is to be found over a larger area than hitherto believed.—*Medicus, Drake, N.S.W.*"

(4) Mr. W. W. Froggatt informs me that he has obtained th Platypus on the Wild River (17° 45′ S.).

I am indebted to Mr. Ernest Favenc for the following note:-

(5) "The highest point north, in Queensland, that I have see the Platypus is on the head of the Broken River, a tributary, o rather a main tributary, of the Bowen River. The head of th Broken River is amongst the high ranges at the back of Po Mackay, and up there the river is permanently running an descends through a succession of gorges to the lower part, whic is sandy The country is peculiar in every way, and more resembl Southern Queensland than it does the general run of the countr about there. The latitude is about 21° S. There are no crocodil up there, but plenty in the Bowen River."

The following letter supplies localities which although we within the known area of distribution, are definite, and therefo worthy of record :—

(6) "Quite recently a son of Mr. John McPherson, of Roc wood, killed a Platypus in Melaleuca Creek, where they are sa to exist in numbers. Melaleuca Creek (23° 34′ S.) runs into t Fitzroy about 20 miles from where the Platypus was kille There are no alligators, so far as I am aware, in the creek, thou they are fairly plentiful in the Fitzroy. The locality I refer is due west of Rockhampton.—*J.T.S.B., Rockhampton.*"

Ialmenus myrsilus, Doubl., bred by Mr. Lyell. Also, for Mr. Maiden, a bunch of curious horn-like galls (Fam. *Cynipidæ*) upon the twig of a Eucalypt.

Mr. R. T. Baker exhibited specimens of a Morell, *Morchella conica*, Pers., from Moonbi Plains, Tamworth, N.S.W., found by Mr. D. A. Porter: also a fossil leaf and some fossil wood from Wyrallah, Richmond River; the venation of the leaf is beautifully preserved, its characters being highly suggestive of *Eucalyptus*.

Mr. T. Whitelegge exhibited a rare and curious Isopod, *Amphoroidea australiensis*, originally described from N.S. Wales by Dana in 1852, since when it appears to have escaped notice. The specimen exhibited was obtained on seaweed at Maroubra Bay last June; when alive it was bright olive-green, and of a similar tint to the seaweed to which it was adhering.

Baron von Mueller contributed the following

Notes on Boronia floribunda, *Sieber*.

In the earlier part of this century (during 1823) the Bohemian botanist, Franz Wilhelm Sieber, formed extensive collections of herbarium plants in the vicinity of Port Jackson and on the Blue Mountains; and although his stay in Australia lasted only seven months, and was limited to N.S. Wales, he extended largely our knowledge of the indigenous flora there, more particularly through the distribution of typic specimens, quoted in De Candolle's Prodromus and in other descriptive works. These records have had significance up to the present day, as will be instanced by one of Sieber's Boronias, namely, *B. floribunda*, which Professor Ignatius Urban, of Berlin, some few years ago, on a re-examination of this plant in Sieber's published set, restored to an independent specific position, Bentham in the Flora Australiensis having regarded it as having arisen from dimorphism. Authentic specimens from Sieber were not available in Melbourne when the first volume of the Flora became elaborated, and thus *B. floribunda* remained to be considered a mere state of *B. pinnata*, until the distinguished Berlin phytographer opened up this question

anew, but I placed after his observation *B. floribunda* alrea into full specific rank in the Second Census of Australian Plan (p 18). Sprengel's diagnosis of this plant published in 1827 very brief and applied as well to some forms of *B. pinnata* as *B. floribunda*, the main distinctions not being given, namely, t much reduced size of four of the stamens and the short style wi much dilated stigma. It was only recently that my attenti from Prof. Urban's indications was directed to this subject, wh Miss Georgina King, the zealous amateur lady naturalist of yo colony, forwarded splendid specimens of *B. floribunda* to me fr the Hawkesbury River, her plant proving to be the genui one of Sieber Unlike *B. pinnata*, which abounds in many plac of four of the Australian colonies, the *B. floribunda* sees restricted to N.S. Wales, and I have it even from your territo only from Mrs. Capt. Rowan, the celebrated flower paintre who sent it mixed with *B. pinnata* from the vicinity of Bota Bay, irrespective of the sendings of Miss King, and I ha Sieberian specimens in the collections of Drs. Steetz and Sond Thus it remains to be ascertained what are the geographic are of *B floribunda*, and this might largely be settled at once by re-examination of Sydney herbaria. The specific validity of *floribunda* will likely be affirmed still further by a search for t ripe fr it, which as yet is to me entirely unknown, good chara

Fresh-water Herrings, represented by a single species, the "Australian Shad," *Potamalosa novæ-hollandiæ* (Cuvier and Valenciennes), Ogilby.

a'. Maxillaries broad, $2\frac{1}{3}$ to $2\frac{1}{2}$ in the diameter of the eye. Teeth entirely absent. Four branchiostegals. Dorsal inserted behind the middle of the body; anal rather long, its base much more than its distance from the caudal; ventrals inserted in advance of the dorsal. Scales pectinated ... *Hyperlophus.*

Marine Herrings, represented by a single species, the "Rough-backed Sprat," *Hyperlophus sprattellides*, Ogilby.

Dr. Cox exhibited some fine living specimens of *Terebratulina cancellata*, Koch, attached to a stone, which he had recently dredged off Forster, Cape Hawke, a new habitat which he thought well worthy of record. Besides the Brachiopods, Dr. Cox stated that he had also dredged the rare *Trigonia Strangei*, and he thought that the locality mentioned was the most northern at which this rare shell had been taken. Dr. Cox also exhibited a fine specimen of *Myochama Woodsi*, Petterd, from the Derwent River, Tasmania.

Professor David contributed the following note "On a remarkable Radiolarian Rock" from Tamworth, N.S.W. :—"On September the 10th, in company with Mr. D. A. Porter, I observed the occurrence of a remarkable radiolarian rock on the Tamworth Temporary Common. Of this rock a hand specimen and section prepared for the microscope are now exhibited. The section is an opaque one prepared by cementing a slice of the rock about one-tenth of an inch thick on to an ordinary glass slip with Canada balsam and then etching its upper surface with dilute Hydrochloric Acid. The rock being partially calcareous, probably an old radiolarian ooze, the lime filling in the delicately latticed shells and interstices between the spines of the radiolaria is dissolved out, and the siliceous shells of the radiolaria become exposed to view. Some of them are exquisitely preserved for

Palæozoic radiolaria. The rock of which they constitute by f the larger proportion weathers into a brown pulverulent frial material like bath brick. The unweathered portions are da bluish grey and compact. The radiolaria appear to be chie referable to the porulose division of the Legion *Spumellar* This discovery confirms the previous determinations by me radiolarian casts in the rocks of the New England district, a of the Jenolan Caves, N.S. Wales. The geological age of t formation in which this rock occurs is probably either Devonian Lower Carboniferous, as *Lepidodendron australe* appears to occ on a horizon not far removed from that of this radiolarian roc The Moor Creek limestone, near Tamworth, I find also contai numerous radiolaria. I propose to offer a paper on this subje at the next meeting of the Society."

WEDNESDAY, OCTOBER 28TH, 1896.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, October 28th, 1896.

The President, Mr. Henry Deane, M.A., F.L.S., in the Chair.

The President formally announced the death, on the 10th inst., of Baron von Mueller, who was one of the first two Honorary Members of the Society to be elected (Jan. 22nd, 1876).

On the motion of Mr. J. H. Maiden, F.L.S., it was resolved that:—

(1) The Members of this Society desire to express the profound regret with which the tidings of the decease of Baron von Mueller have been received; and at the same time to place on record their high appreciation of the Baron's life-work, which has in so eminent a degree contributed to the advanced state of our knowledge of the Flora of Australia.

(2) A copy of this resolution be forwarded to the surviving sister of the late Baron with an expression of the Society's sympathy in her bereavement.

The President read a letter from the Royal Society of Tasmania offering to co-operate in any movement to raise some appropriate Memorial of the late Baron von Mueller.

Pharmaceutical Journal of Australasia Vol. ix. No. 9 1896). *From the Editor.*

Indian Museum, Calcutta—Natural History Notes. Se No. 23 (1896): Materials for a Carcinological Fauna of No. 2 (1896). *From the Museum.*

Perak Government Gazette—Vol. ix. Nos. 20-21 (Aug. 1896). *From the Government Secretary.*

Société d'Horticulture du Doubs, Besançon—Bulletin. Illustrée. No. 8 (August, 1896). *From the Society.*

K. K. Zoologisch-botanische Gesellschaft in Wien—Ve lungen. xlvi. Band (1896), 7 Heft. *From the Society.*

Société des Sciences de Finlande—Observations Mét giques faites à Helsingfors en 1895: Observations Mét giques, 1881-90. Tome Supplémentaire: Pamphlet en "Météorologie et Magnétisme Terrestre." *From the Societ*

Marine Biological Association of the United King Journal. New Series. Vol. iv. No. 3 (August, 1896). *the Association.*

Bureau of Agriculture, Perth, W.A.—Journal. Vol. iii 23 (Sept., 1896). *From the Secretary.*

Archiv für Naturgeschichte. lvii Jahrg. (1891). ii. Band. 1 Heft: lx. Jahrg. (1894). i. Band. 2 Heft: lxi. Jahrg. (1895). i. Band. 1-2 Hefte: Register, 26-60 Jahrg. (1895). *From the Editor.*

Senckenbergische Naturforschende Gesellschaft, Frankfurt a. M. —Abhandlungen. xix. Band. 1-4 Hefte (1895-96): xxii. Band. and Supplement (1896). *From the Society.*

"A Statistical Account of the Seven Colonies of Australasia." Sixth Issue (1895-96). By T. A. Coghlan. *From the Author.*

Geological Survey of India—Palæontologia Indica. Ser. xvi. Vol. i. Part i (1895). *From the Director.*

Department of Agriculture, Sydney—Agricultural Gazette. Vol. vii. Part 9 (Sept., 1896). *From the Hon. the Minister for Mines and Agriculture.*

Melbourne Exhibition—Handbook to the Aquarium, Museum, etc. 2nd edition (1896). *From the Exhibition Trustees.*

Pamphlet entitled "Description of a Collection of Tasmanian Silurian Fossils, &c." By R. Etheridge, Junr. (1896). *From the Royal Society of Tasmania.*

Royal Society of Edinburgh—Proceedings. Vol. xx. (1893-95): Transactions. Vol. xxxvii. Parts iii.-iv. (1893-95): Vol. xxxviii. Parts i.-ii. (1894-95). *From the Society.*

L'Académie Royale des Sciences, &c., de Danemark, Copenhague—Bulletin, 1896. No. 4. *From the Academy.*

Australasian Journal of Pharmacy. Vol. xi. No. 130 (Oct., 1896). *From the Editor.*

Department of Agriculture, Brisbane — Bulletin. No. 11. Second Series (1896). *From the Secretary for Agriculture*

AUSTRALIAN *TERMITIDÆ*.

Part II.

By Walter W. Froggatt.

(Plates xxxv.-xxxvi.)

Classification.

In dealing with the insects in this remarkable family, met with the difficulty that, while standing alone, in respects they combine the characteristics of two distinct and though classified by most of our leading entomologists the Neuroptera or Pseudo-Neuroptera, there are almost reasons for placing them in the Orthoptera, while in thei habits they conform to the ants and bees among the Hymer It is well known that the termites come from a very stock, a great number of species having been found in th state in Europe and America. Brauer* considers that t highly modified forms of a type which departed little fr

Dr. Packard, who has given the termites a considerable amount of attention,* in his Entomology for Beginners has erected the Order *Platyptera* (insects with wings flat upon the back) in which he places them with the *Psocidæ* and *Perlidæ*; but they seem to have little affinity in other respects with the stone-flies and the book-louse.

If the wings and the tip of the abdomen be removed from one of the larger termites it might be very easily mistaken for an earwig; and one of our greatest authorities† on the Neuroptera actually described a supposed "wingless termite" from Japan under the name of *Hodotermes japonicus*, but in the following volume appeared a note from the author, stating that upon comparison with a Japanese *Forficula* he had found that the supposed termite proved to be a damaged earwig. Dr. Hagen also remarks that in his opinion "the three families *Termitina*, *Blattina*, and *Forficulina* are co-ordinated, and very nearly allied" (p. 139).

If the wings of the larger termites are compared with those of several of our cockroaches, it will be found that there is a marked resemblance in the form of the parallel nervures with the recurrent forks without any true cross veins running to the extremities of the wings in the cockroaches, while in the termites they generally turn downward, but this is not always the case, for in the wings of a very large termite from Northern Australia (for which I propose the name *Mastotermes darwiniensis*) and some species of *Calotermes*, the parallel veins are stout and thick, forking again and again till they run out at the tips, while in *Mastotermes* the fore wings have several more stout nervures than the hind pair.

Termites do not closely resemble any of the lace-winged insects in their perfect state; their metamorphosis is incomplete, as they pass from the egg to the active little larvæ with perfect propor-

* Notes on the external anatomy will be found in Third Report U.S. Entom. Commission, 1883, pp. 326-329.

† Dr. Hagen, Proc. Bost. Soc. of Nat. History. xi. p. 399, 1868.

tions, increasing in size with each successive moult, but little termites from birth, even the soldiers in some species the elongated form of the head long before they reach ma

I consider they have a greater affinity to the Orthopte the Neuroptera, and, without going into the anatomy family, which I leave to an abler pen, would suggest th form a natural link between the two orders, coming af *Forficularidæ* and *Blattidæ*.

I have followed Dr. Hagen in the terms used for the v of the wings and general structure. I try also to descri species with its habits and life history when obtainable, our coming entomologists will be able to recognise the without much difficulty. In a few instances I have de winged forms only, in the hope of afterwards getting th forms to complete their life-histories. I have a great nu winged specimens evidently belonging to different specie retain till I have completed the series for the various l from which they were taken.

Family TERMITIDÆ.

Perfect insects slender, with a rounded head, and lar pound eyes more or less projecting on the sides of the hea

[redacted]

short concave or sloping transverse veinlets very variable in number and disposition. The remarkable transverse suture near the base of the wings causes them to drop off at the slightest obstruction, leaving behind attached to the thorax a small slender flap (which I have termed the scapular shield). In the legs the coxæ are large, with a transverse trochanter at the base, to which the thighs are attached and not to the coxæ; the femora are generally stout and short; the tibiæ slender and cylindrical, with two or more stout spines at the tip; the tarsi consist of four joints, the first three round, with the terminal one slender, armed with sharp curved claws, at the base of which there is sometimes a plantula.

The abdomen consists of ten segments, forming an elongated rounded body with a pair of cerci at the base of the 9th segment, and in many species there are sometimes two other slender jointed appendages known as the anal appendices.

The integument consists of chitinous plates, generally very thin and delicate, but in some of the larger species of considerable strength.

Termites live in social communities, either constructing distinct nests, earthy mounds covering a woody nucleus, known as a Termitarium, or else simple tunnels or galleries under logs, stones, or in the timbers of houses. Each community consists, broadly speaking, of three castes or classes. Firstly, the winged males and females, which are found in great numbers only at certain seasons of the year, but always in the nests in a larval or imperfect form. Secondly, the workers, aborted males and females, wingless, pale yellow, or white, with a large oval body and no very distinctive characters in most species; these do all the work of the nest, building the walls, gnawing out the wood, and looking after the eggs and young larvæ. Thirdly, the soldiers, also aborted males and females, which have the jaws produced into long scissor-like projections, closing over or meeting at the tips like a pair of shears, very constant in form in the different species, and of use in classification.

at the tip of the snout; and this is used as a mea

This protective fluid is also made use of amc two-jawed soldiers, and when this is the case the c the base of the clypeus, and the ejected fluid is t

The abdomen of the soldiers is more slender t workers. Their duties are to protect the wo enemies when the walls of the galleries are broke to direct them at their work.

These are the first three primary forms found there is a great number of secondary ones. Firs among these is the queen, produced from a winged by a male (both of whose wings have either d pulled off, and who after their flight with the othe from the parent nest, have been taken care of b who have probably in the first instance found th After fertilization the body swells out into an i elongate, cylindrical sac the original chitinous p ments forming black bars across the intersegment the abdomen, now consisting of a mass of egg tube queen incapable of active locomotion.

Next come the complementary queens, anothe female termite which seems to have reached a s with an enlarged corrugated abdomen, and though egg-producing they are capable of becoming so i appear to be "kept in stock," so to speak, to re

rudimentary wings as she has. I have as many as ten supplementary queens taken from a single mound. Müller was the first to notice the forms when working out the life-histories of the termites of Santa Catherina in Brazil*; in one nest he found 31 complementary queens. Besides these there are larvæ in all stages of growth, from minute little creatures just emerged from the eggs to pupæ with the wing-cases extending half way down the back; as well as young workers and soldiers, the latter showing the alteration in the form of the head before the last moult.

Lately near Newcastle when turning over some logs I found a nest of *Eutermes fumigatus*, Brauer, in which the queen was exposed in the centre of the irregular galleries damaged by the removal of the log; and among the Eutermes I found six or seven reddish-brown perfect insects (excepting that they were minus their wings) of some undetermined species of *Calotermes*; these did not seem to be quite at home, but had evidently crawled in under the log for shelter, and thus found their way into the nest.

The family *Termitidæ* has been divided into seven genera, and four subgenera, several comprising both fossil and existing species, others only modern forms, and three fossil species only.

Though a good deal of work has been done by entomologists upon this family it has always been upon different genera. The late Dr. Hagen's Monograph upon the *Termitidæ* is our only guide to the general classification of the family, and this was published nearly 40 years ago. His proposed Monograph upon their anatomy was never published, beyond a short paper on *Eutermes rippertii*.† His classification is chiefly founded upon the structure of the wings, the ocelli, the number of joints of the antennæ, the shape of the prothorax, and the tibial spines.

Following this very natural classification, I have considered his four subgenera as genera, and further grouped them into

* Fritz Müller, "Beiträge zur Kenntniss der Termiten." Jen. Z. Nat. vii. pp. 337, 463.

† Psyche v. pp. 203-8, 1889.

subfamilies based upon the neuration of the wings, al
into account the habits, and the form of the soldiers, wl
to be very similar in most of the genera I have observed
case of the genus *Hodotermes* and the two subgenera *Stolot*
Porotermes I have been somewhat puzzled. In Hagen's
of *Hodotermes* he says "ocellis nullis," but in his figure of
(Tab. iii. fig. 8) he shows lateral ocelli, and in the C
Natural History, published last year (Vol. v. p. 556),
of *Hodotermes mossambicus* is given "after Hagen," in w
lateral ocelli are most distinctly drawn. The only speci
group that I have in my collection is a doubtful sp
Stolotermes ruficeps, Brauer, which has no ocelli, and a
my Australian specimens I have not yet found any tha
placed in this group, but an allied group for which I pr
name of *Glyptotermitinæ* takes their place in the Australi
I have placed the genus *Rhinotermes* after the *Calotermit*
a careful study of their habits and the robust form of t
I was acquainted with a very curious white ant with t
different-looking kinds of soldiers, but of which I had n
winged forms among the New South Wales specimens;
collection from Queensland I found a number of winged sp
that on comparison with a co-type of Brauer's *Rhinoterm*
medius (for which I am indebted to the Director of the

sloping cross nervures forming a network of smaller ones at the tip. Fore wings differing from the hind pair in the venation in many species.

1. Genus MASTOTERMES, g.n.

Head large, flattened on the summit; eyes large; ocelli small; antennæ 30-jointed; prothorax large, with the sides turned up; scapular shield with more than five branches.

2. Genus CALOTERMES, Hagen. (Recent and fossil.)

Head round; eyes large, projecting; ocelli small; antennæ 16-20-jointed; prothorax large and broad.

3. Genus TERMOPSIS. (Recent and fossil.)

Head large, broadest behind; eyes small, oval; ocelli wanting; antennæ long, 23-37-jointed; prothorax small, not as wide as the head.

4. Genus PAROTERMES. (Fossil.)

Head rather large; eyes small; ocelli wanting; antennæ 20-jointed; prothorax subquadrate, not broader than the head.

5. Genus HODOTERMES. (Recent and fossil.)

Head large, circular; eyes small; not projecting, facets coarse; ocelli wanting; antennæ 25-27-jointed; prothorax small, broader than long.

6. Genus POROTERMES. (Recent.)

Head small; eyes small, facets fine; ocelli wanting. Venation of the wings very fine.

7. Genus STOLOTERMES. (Recent.)

Head large, circular; eyes small, facets coarse; ocelli present; antennæ 12-14-jointed; prothorax heart-shaped.

8. Genus MIXOTERMES. (Fossil.)

Founded by Sterzel upon a fossil wing from Lugau. Allied to Calotermes (Berichte der Naturwissenschaftlen Gesellschaft zu Chemnitz. 1878-80).

ii. Subfamily RHINOTERMITINÆ.

Scapular shield broad, slightly convex at the cross suture, w four branches. Costal and subcostal nervures very stout, runn to the tip of the wing, and joined at the extremity with sh irregular thick nervures; median and submedian nervures slend with a great number of fine oblique nervures, and all the wi thickly covered with fine furrows.

1. Genus RHINOTERMES. (Recent.)

Head broad; eyes small, projecting and coarsely faceted; ocel small; antennæ 20-jointed; prothorax not as wide as the hea rounded in front.

iii. Subfamily GLYPTOTERMITINÆ.

Scapular shield slender, angular, with the cross suture trans verse, with four or more branches. Costal and subcostal nervure running very close to each other, the latter often merging int the former in the centre; median nervure running through th upper half of the wing, and the submedian about the middle, th latter and the oblique nervures often formed of fine spots or scar

1. Genus GLYPTOTERMES. (Recent).

and submedian slender, the former divided into one or more forks at the extremity.

1. Genus TERMES. (Recent and fossil.)

Head large, rounded; eyes large, and prominent, finely faceted, ocelli present; antennæ 13-20-jointed; prothorax heart-shaped; flattened, smaller than the head.

2. Genus EUTERMES. (Recent and fossil.)

The form of head and thorax very similar to that of *Termes*; wings always dark coloured, with the base of the nervures in the scapular shield not as robust as in the latter. Soldiers always nasuti.

3. Genus ANOPLOTERMES. (Recent.)

A genus formed by Müller on the internal anatomy of a Eutermes from Brazil (*A. pacificus*). He also places *Eutermes ater*, Hagen, and *E. cingulatus*, Burm., with the new species.

CALOTERMITINÆ.

MASTOTERMES, g.n.

Head large, nearly as broad as long, flattened upon the summit; eyes large, projecting; ocelli prominent; antennæ 30-jointed; clypeus large, labrum rounded at the apex. Prothorax shaped like that of *Calotermes*, except that it is turned up on the outer edges, with the scapular shield as long as the meso- and metathorax. Fore wings differing from the hind pair in venation in having fewer parallel nervures between the costal and subcostal, the upper portion of the wings crossed with stout nervures, with the whole of the wing finely reticulated with smaller veinlets. Tibiæ with four spines at the apex; claws large with a small plantula.

This genus is founded upon a species from Port Darwin, W. Australia, and is allied to *Calotermes*.

MASTOTERMES DARWINIENSIS, n.sp.

(Pl. xxxv. figs. 3-3*a*.)

Head castaneous, thorax dark ferruginous; legs, under side and abdomen dark brown; antennæ yellow; wings, scapular shield and

nervures ferruginous; the rest yellowish-brown. Length of the wings 16, body 8 lines.

Head large, nearly as broad as long, rounded and br behind, rounded on the summit, flattened and rugose in truncate across in line with the eyes. Eyes large, circula jecting, very finely faceted; ocelli large, oval, close to inner m of the eyes. Antennæ long and slender, 30-jointed, springing a depression in front of the eyes; 1st joint large, cylin broad at apex; 2nd nearly as thick but shorter; the others liform to near the tip where they become more stalked, th being the smallest. Clypeus arcuate and broad behind the forming little angular flanges, with the middle quadrat lobed in the centre; labrum broader than long, almost qua with the sides rounded and flattened, shell-shaped; palpi with the base of each joint white; jaws broad and rounded, two small angular teeth at the tip, and a flattened unto edge to the base slightly hollowed out in the middle. Protl as wide as the head, wider than long, concave in front, rotur with the sides and apical margin forming a half circle, dep in the centre, with the edges (particularly on the sides) t up. Legs short, thighs stout, with the tibiæ covered wit hairs, and four stout spines at apex; tarsi short, havin terminal joint slender, with four small sharp spines and a

fine, irregular, running through the middle of the wing, with six short stout oblique nervures at the base, and seven or more slender nervelets running out towards the edge and forming a network all over the wing. Hind wings with only two parallel nervures between the costal and subcostal, one bifurcation less on the subcostal; median forked in the middle of the wing, upper branch bifid at tip, lower one turning downward and again branching; upper one bifid, lower one simple; submedian as in the fore wings, but irregular in the neuration of the oblique nervelets. Abdomen short, broad, and rounded at the tip, with short cerci; anal appendices small, slender, close together, near the tip of the abdomen.

Hab.—Port Darwin, N.T. (Mr. N. Holtze); Northern Territory (Mr. J. G. O. Tepper).

Among a number of pinned specimens of termites sent to me by Mr. Tepper was a single specimen of this species, which was very noticeable from the network of veins along the costal margin, as well as its large size. During the summer of the following season, Mr. Holtze sent me seven specimens in spirits, taken "flying round the lamp at night" in the Botanic Gardens, Palmerston.

There are two specimens in the Macleay Museum, one of which is labelled Cleveland Bay (Townsville), N.Q., collected, Mr. Masters thinks, by Mr. Spalding; and another from King's Sound, N.W. Australia, taken by myself, flying round the lamp, at a station about 100 miles inland from Derby.

Genus CALOTERMES, Hagen, 1853.

Hagen, Bericht d. K. Akad. Berlin, 1853, p. 480; Linnæa, xii. p. 33.

Head rather small, triangular or rounded; eyes large and projecting from the sides of the head; ocelli small; clypeus small, flattened; labrum small, quadrangular; antennæ as long as the head, 16-20-jointed, antennal cleft small; jaws short, stout and blunt. Prothorax large, as wide or nearly as wide as the head, broader than long, truncate or arcuate in front, with the sides

and apical edges forming a semicircle. Legs stout, the tip of tibiæ with three or four spines; tarsi with plantula. Wings lar narrow, twice or thrice as long as the body; subcostal narro widening out towards the tip and connected to costal by five six veins, irregular in number, forming a network between th two; median nervure slender, running through the middle of th wing, with irregular cross veinlets, the whole of the outer portion of wing showing an irregular network : scapular shield as long as mesothorax in the fore pair, and about half the length o metathorax in the hind pair. Abdomen small, a little wider than the thorax; cerci stout, short, and jointed.

Soldiers short and stout. Head large, cylindrical, flattened in front and rugged or truncated before the jaws, which are stout and strong, about one-third the length of head, almost straight, flattened towards tips, close at the base, with short stout teeth, irregular on opposite jaws; labrum small, short, and transverse or quadrangular.

These termites do not construct regularly formed nests, but live in small communities in logs, timber, beams of houses or under stones; many nests contain under a hundred individuals chiefly workers or immature nymphs, and sometimes only half a dozen soldiers, though in others these are more numerous. have never found a queen among any community of the genus.

Head elliptical, much longer than broad, scarcely smaller than the thorax. Antennæ shorter than the head, probably 13-jointed. Ocelli close to the eyes. Jaws small, two-toothed, with dark points. Prothorax with an indistinct suture in the centre, much broader than long, concave anteriorly, sides convex, flattened behind; body scarcely longer than the thorax. Legs stout, with the 4th joint of tarsi as long as the first three combined. Wings pale brown, costal and subcostal nervures ferruginous, with about 12 oblique branches; the other nervures very pale and indistinct, with rows of finer ones between them, from the lower side about 12 oblique branches, the wings generally feeble and wrinkled.

Soldier greyish, hairy, shining. Length 3 lines. Head oval, reddish-yellow, flat on the summit, ferruginous in front, longer and broader than the thorax; jaws blackish, robust, almost straight, bent in at the tips and armed with two broad teeth. Antennæ shorter than the head, the extremity of each segment light coloured, shorter towards the tip. Prothorax twice as broad as long, anterior angles concave, sides and posterior angles convex, body club-shaped, broader and longer than the thorax, 3 lines in length.

Worker grey. Head small, with a pitch-coloured spot between the antennæ, the latter almost as long as the head; body almost club-shaped, very much broader and longer than the thorax. Length 3 lines.

Hab.—Tasmania, and Swan River, W.A.

This description is taken from Hagen's Monograph. He says: "In comparison with the type, the somewhat larger *Termes obscurus* from Swan River (long. corp. 2½, exp. alar. 7 lines), is not otherwise different from *T. convexus*. Between the claws is seen a plantula. This species closely resembles *Calotermes improbus*, and whether it should remain separate is a matter for further consideration, though it is much smaller. The workers and soldiers described by Walker (Brit. Mus. Cat. p. 52) as belonging to *Termes australis*, are very probably those of *C. improbus*."

Calotermes insularis, White.

Calotermes insularis, White, Voy. Erebus & Terror, Zool. Pl
(Pl. xxxv. fig. 4.)

General colour bright ferruginous, wings hyaline, nervu light brownish-yellow. Length to tip of wings 11, to the tip body 5 lines.

Head longer than broad, rounded behind, widest behind th eyes, sloping on sides to apical margin, truncate in front, conve on the summit, sharply sloping down on the forehead. Eye moderately large, round, coarsely faceted, projecting slightly o the sides; ocelli large, round, contiguous to front of the inne margin of the eyes. Antennæ broken (probably about 20-jointed) springing from a cleft in-front of the eyes; joints all parti coloured, the apical edges barred with pale yellow; 1st-3rd cylindrical, basal ones largest, 4th orbiculate, the remaining one turbinate, lightly fringed with hairs. Clypeus wide at base, bu very narrow, sloping on the sides to rounded tips at the centre labrum broad, rounded in front. Prothorax very large, broade than long, deeply concave in front, rotundate and rounded behind showing faint median suture; meso- and metathorax muc narrower. Legs short, thighs broad and rounded; tibiæ shor with three stout spines at apex, terminal joint of the tarsi shor

near the tip, where several short ones form an irregular network, but having a number of short spine-like nervures along the lower margin; submedian nervure running through the middle of the wing, turning downwards before reaching the tip, with six stout oblique unbranched nervures at the basal portion, and nine fine oblique nervures beyond; the whole wing finely covered with indistinct veinlets giving it a frosted appearance. Abdomen very short and thick, smooth and shining; with the cerci of usual size; anal appendices undistinguishable.

Hab.—Melbourne, Victoria (Mr. Kershaw).

Only one dry pinned specimen, from the National Museum, Melbourne, but very distinct from any of my other species, and remarkable for the very long wings.

CALOTERMES IRREGULARIS, n.sp.

(Pl. xxxv. figs. 1, 1*a*, 1*b*).

Head ferruginous; thorax and abdomen ochreous; antennæ, legs and under surface lighter coloured; wings pale ochreous, with the nervures fuscous. Length 8 lines to tip of wings; body 4½ lines.

Head rounded behind, longer than broad, sloping in from the eyes to the clypeus, lightly clothed with a few scattered hairs. Eyes very large, projecting; ocelli large, rounded oval, contiguous to the centre of inner margin of eyes. Antennæ 19-jointed, hirsute; 1st joint large, cylindrical, springing from a shallow antennal cleft below the eyes; 2nd cylindrical, smaller, and half the length; 3rd more rounded at the tip; 4th shortest; 5-12 moniliform, slightly increasing in size toward the extremity; 13-18 longer, turbinate, with the last elongate-oval. Clypeus small, rounded in front, sloping on sides, broadest behind; labrum large, shell-shaped, rounded in front; jaws large, stout, with the apical tooth large, curved inwards, a short conical one below, with two stout angular ones towards the base. Prothorax as broad as the head, slightly concave in front, rounded on the sides, truncate behind, showing a slight median suture; mesothorax narrow, with

rounded base, a slight median suture; metathorax smaller, round behind. Legs short, rather hairy; thighs short and stout; tibi moderately long, with three short stout reddish spines at th apex; tarsi with the terminal joint not quite twice as long as th three preceding ones combined, tarsal claws long and slender plantula oval. Wings more than twice as long as wide, broad and rounded at tips; scapular shield long; costal, subcostal and median nervures running parallel to each other at equal distances apart to the tip of the forewing; subcostal with five oblique veins running upwards into costal; median furcate at the tip; sub median nervure slender, with about 13 oblique nervures, the last four furcate; median with a number of short irregular veinlets along the lower edge, and a faint irregular network of nervelets over the whole wing. Hind wing: costal and subcostal nervures running into each other in the middle of wing; median furcate a short distance from shoulder, the upper branch dividing into five oblique veins, turning upwards into the costal; the lower branch running parallel, straight out to extremity of wing: the rest of wing as in fore pair. Abdomen large, smooth, shining, rounded at tip; cerci short, stout and hairy.

Soldier.—Head rufous, jaws black; legs, antennæ, and pro thorax pale ochreous; the rest dirty white. Length 6, from tip [redacted]

rounded in front, with a dark spot on either side; labrum long, narrow and truncate in front and straight on the anal appendices large, at right angles to each other; cerci ;hers; body long and cylindrical.

—Mackay, Queensland. (Mr. G. Turner).

CALOTERMES IMPROBUS, Hagen.

Hagen, Mon. Linnæa, xii. p. 44.

nut brown, head somewhat darker; antennæ, legs, and le bright yellow; head and thorax smooth, not hairy. 6½ mm.

oblong, quadrangular, almost half as long again as broad, posteriorly. Eyes small, projecting slightly, well in head; ocelli large, away from the eyes, a small central mark ocellus almost in a line with the hind margin of the eyes. e short and stout, longer than the head, 20-jointed, d, round; first joint larger than the following ones, 4th smallest. Labrum short, oblique below the jaws; labial icker and shorter than in the other species. Prothorax oader than the head, rounded and flat, sides turned down , concave, rounded posteriorly, the angles rather truncate Scapular shield of forewings large, round and truncate, han the mesothorax. Wings wanting. Legs short, with ines at apex of tibiæ; the only existing claw is short, nd curved; if a plantula is present it is not noticeable in cimen. Body egg-shaped, broad; abdominal appendices all, two small cerci.

bove description is taken from Hagen's Monograph. He d this species from one imperfect specimen, without wings, h only one imperfect leg.

—Tasmania. It does not agree with any of my species ustralia. But in the case of a species known only from a nperfect individual it would be hard to identify it without series of specimens collected in the same locality.

Calotermes longiceps, n.sp.

(Pl. xxxv. fig. 7.)

(Immature). Head pale yellow, jaws black, rest of ins white. Length 6 lines.

Head spherical, a little longer than broad. Eyes ind ocelli (?). Antennæ 20-jointed; 1st stout, cylindrical; joi very short, orbiculate; the rest moniliform, towards t becoming broader at apex; the last smaller, elongat Clypeus truncate behind, rounded in front, narrow: labrum convex in front: jaws short and stout, with three teeth and two angular ones at base. Prothorax as broad as slightly concave in front, broadly rounded on sides, and truncated at apex, with a median suture extending throu rest of the thorax; wing covers extend down to the third se of the abdomen, slender and pointed. Legs rather short; small, slender; tibiæ short and thick, with three stout ferru spines at apex; tarsi short, terminal joint large, with plant stout claws Abdomen long, cylindrical, rounded at the ti very small anal appendices, and the cerci small and hairy

as the head, short, concave in front, truncate behind and rounded on the sides: legs short, thighs thick: abdomen short, and very broad in proportion, flattened, anal appendices showing at tip of abdomen, cerci small.

Hab.—Sydney, N.S.W. (W. W. Froggatt).

This species lives in dead logs, in small communities of fifty or a hundred, and in several that I have cut out of firewood they have consisted of immature winged ones, with only one soldier, and one or two workers. I have never been able to breed the perfect insects, though a number of them lived for some months in a tin.

Calotermes robustus, n.sp.

(Pl. xxxv. fig. 8.)

Head and prothorax dark ochreous, the upper surface of the rest of the thorax and abdomen lighter coloured; antennæ, under surface and basal portion of legs light ochreous, with the tibiæ and tarsi slightly ferruginous; wings semi-opaque, with the nervures ferruginous. Length to tip of wings 9; to tip of body $5\frac{1}{2}$ lines.

Head orbiculate, about as long as broad, convex, and rounded on summit. Eyes large, coarsely faceted, projecting; ocelli large, oval, contiguous, and in line with the front of the eyes. Antennæ 19 jointed, long and slender towards the tips, springing from a circular antennal cleft in front of the eyes; 1st and 2nd joints large, cylindrical; 3rd-8th short, moniliform; 9th-12th turbinate; 13th-18th more stalked and elongate; terminal one much smaller, slender, elongate, oval. Clypeus rounded in front, very prominent, divided in the centre by a suture forming two convex lobes; labrum large, rounded in front. Thorax with a fine dark median line running down to apex of metathorax; prothorax much broader than long, as broad as the head, truncate at both sides, slightly depressed in the middle of each, and rotundate on the sides, smooth and shining. Legs rather long, thighs com-

paratively slender, tibiæ short and rather bent, with four sto spines at the apex; tarsi long, claws stout, plantula small.

Wings large, more than thrice as long as broad, rather pointe towards the tips; fore and hind wings differing in the neuration scapular shield short, rounded, with the cross suture curvin round showing the base of the six branching nervures; costa more robust than usual, receiving two stout parallel nervure running out of the scapular shield and sloping up into it; sub costal sending out four other cross nervures sloping into the costa beyond them, and a number of more transverse ones formin numerous short cells towards the tip of the wings; median nervur running close to subcostal and connected with it at irregula intervals by a number of transverse nervures most numerou towards the apex; submedian running through the middle of th wing, with six oblique short thick opaque nervures at base, anc five slender nervures branching out, turning downwards an again dividing before reaching the margins; the whole wing thickl reticulated with finer veinlets: hind wing with only one paralle sloping nervure between the costal and subcostal, but connecte to the costal with two very short oblique nervures as well as a the tip; subcostal nervure running parallel and sending out thre oblique nervures running into the costal, and ending in a regula network at the tip; there is no true median nervure, but a branc

CALOTERMES BROUNI, n.sp.

(Pl. XXXVI. figs. 1-1*a*.)

General colour dark reddish-brown, with the wings fuscous and the nervures chocolate-brown. Length to tip of wings 5, length to tip of body 3 lines.

Head longer than broad, rounded from the base to the front of the eyes, flattened on the summit and arcuate on the forehead. Eyes large, oval, not projecting very much, finely faceted; ocelli large, reniform, contiguous to the inner margin of the eyes. Antennæ springing from a cleft in front of the eyes; (?) 14-jointed; 1st joint large, cylindrical; 2nd and 3rd of equal length; 4th smallest; the rest broadly pyriform, more truncate on the apical edge towards the tip. Clypeus small; labrum large, quadrate, with the sides rounded in front; jaws stout, with two teeth at the tip, the others indistinct; palpi short and stout. Prothorax broad, truncate in front, slightly concave behind the head, sloping on the sides, slightly concave behind. Wings slender, more than thrice as long as broad; scapular shield large, with five branches, and one parallel vein running into the costal behind the second transverse from the subcostal; subcostal nervure sending out seven transverse nervures running into the costal, and irregularly forked at the tip; median nervure running parallel to subcostal, but merging into it before reaching the tip either in the last fork or the seventh transverse nervure of the subcostal, with three or four oblique irregular slender nervures turning downwards; submedian nervure with five thick oblique nervures at the base, and six slender ones all forked at the tips; the whole wing finely reticulated between the nervures. Legs short; thighs very thick; tibiæ short and stout, with the apical spines very large; terminal claws of the tarsi large; plantula small. Abdomen short, cylindrical, rounded at the tip, with stout conical cerci.

Soldier.—The head ochreous, more ferruginous towards the jaws; antennæ bright yellow, with the apex of the joints pale, the rest dull white. Length 3 lines. Head long, cylindrical, rounded

behind, nearly twice as long as broad, sloping down on the forehead, rugose behind the clypeus; antennæ 13-jointed, springing from a cleft on the sides of the head; 3rd joint shortest, the rest broadly pyriform, the last elongate-oval, clypeus small, truncate upon the sides; labrum large, rounded on the sides and tip; palpi slender, short; jaws broad and stout, curved and slender at the tips, with two angular teeth about the centre, rugose to a large angular tooth at the base; jaws crossing over each other to the centre; left jaw with only one tooth in the centre. Prothorax rounded on the sides, concave in front; abdomen elongate-oval; anal appendices long and hairy, cerci short and stout.

Worker with the head only pale yellow; length 2 lines. Head spherical; antennæ shorter and thicker than those of the soldier; thorax not quite as broad as the head; abdomen long, cylindrical, pointed at the apex.

Hab.—Drury, New Zealand (Captain Thomas Broun).

Spirit specimens of this species were sent to me by Captain Broun under the impression that it was *Calotermes australis*, White. It is, however, a very different form, differing both in size, colour, and other details. I am also indebted to Captain Broun for the following information:—"This species originally inhabited the 'Puriri' (*Vitex littoralis*) in our northern forests, where I have frequently cut out the nests containing only a small

ochreous: antennæ, legs, and all the under surface lighter coloured; wings pale fuscous with the nervures reddish-brown. Length 7½ to tip of wings, 3 lines to tip of body.

Head broad, rounded behind, flat on summit, longer than broad, blackish and rugose along the front margin, with a small rounded pit in centre behind the clypeus. Eyes very small, round and standing out; ocelli wanting. Antennæ 16-jointed, antennal cleft deep; 1st joint large, broadest at apex; 2nd smaller; 3rd smallest; 4th 5th short; 6th-15th turbinate; 16th elongate-oval, smaller than the others. Clypeus small, pale yellow, truncate behind, rounded in front; labrum large, pale yellow, contracted at base, broad and rounded in front; jaws stout, with two sharp-pointed teeth at tip, and two large flat ones at base. Prothorax short, nearly as broad as the head, almost truncate in front, with a depression in the centre, rounded on sides, slightly arcuate behind, flattened on summit, with the edges slightly turned up; meso- and metathorax large, with a dark median suture, round at apical margin. Legs moderately long; thighs thick, short; tibiæ long, slender, with three stout spines at base; first three joints of tarsi short, 4th twice as long as the three others combined; claws large; plantula wanting. Wings large, slender, rounded at tips, thrice as long as broad; scapular shield small, round at base; tinted with ochreous yellow which extends slightly into the base of the wing: costal and subcostal nervures running parallel to each other and turning round the tip, a stout parallel nervure running out of the scapular shield and turning into the costal about the first quarter; four stout oblique nervures running upwards into the costal, with a network of more irregular shorter ones round the tips, forming irregular cells; median slender, running out towards the tip and branching out into three slender nervures turning downwards; submedian stout at base, slender beyond and turning downwards a little beyond the middle of the wings, with nine oblique nervures, the first six short and thickened, the whole wing covered with an irregular dainty network of nervelets; hind wing with the oblique nervures fewer than in the former, the median nervure running out to tip of wing, dividing into a single

black; antennæ and palpi dark reddish-brown at ba
giving them a variegated appearance; the rest of
ochreous, with the legs rather darker. Head longe
broadest at base contracting slightly behind the bas
flattened on the summit, a faint median suture witl
one turning down on either side into a raised kn
antennal cleft: clypeus large, with a black protuber
margin; labrum contracted at base, rounded on side
downwards in front: antennæ more slender, and mo
the third joint to tip; palpi very long, extending
tip of jaws; jaws short and stout, slightly curved i
with three sharp incised teeth on the upper por
large one below; right jaw with one curved fan
a broad angular tooth below; prothorax more sharp
tips, not as wide as the head, with median sut
through it to base of metathorax; abdomen large,
narrowest at tip; cerci large; anal appendices large,
standing out perpendicularly.

Worker.—Head pale ochreous-yellow, with a dar
spot in front on either side of clypeus, the rest
pale yellow; length $4\frac{1}{2}$ lines; head large, orbicula
broad; abdomen large, cylindrical, rounded at tip.

Hab.—Uralla, N.S.W. (Mr. G. McD. Adamson).

This termite differs from the other members of
having no ocelli, but the wings are so typical that

Genus TERMOPSIS, Heer.

Heer, Insektenfauna von Oeningen, 1848.

Head large, rather oval, broadest behind and suborbiculate; es small, oval, not very prominent; ocelli wanting; antennæ ıg, 23-27-jointed. Prothorax small, not wider than the head, nicircular, flat. Legs long, robust, furnished with tibial spines l plantula. Wings as in *Calotermes*. Abdomen egg-shaped; l appendages long, 6-jointed.

his genus contains three species described by Heer and Hagen n fossil specimens in Prussian amber; and two existing species, from Manitoba and California, and the other from the west it of South America.

othing particular is known about the habits of the existing ies, but the genus is evidently closely allied to *Calotermes*.

Genus PAROTERMES, Scudder.

Proc. Amer. Acad. of Arts and Science, 1883.

his genus was formed by Scudder for the reception of three il species found in the American Tertiaries of Colorado, U.S. says, "These species are most nearly allied to *Termopsis* and *ıtermes*, but differ from each of them in points wherein they ır from each other, and have some peculiarities of their own. y differ from *Calotermes* in their shorter wings (relative to the ;th of the body), which lack any fine reticulation, and in their ıt of ocelli. From *Termopsis* they differ in the slenderer but shorter wings without reticulation; their uniform scapular (subtal ?) vein running parallel to the costa throughout, and proed with fewer and straight branches. From both they differ in presence of distinct inferior branches to the scapular vein, but ecially in the slight development of the intermedian vein and median vein, the excessive area of the externomedian vein, and course of the latter, which is approximated much more than ual to the scapular vein and emits branches having an unusually ıgitudinal course."

Genus MIXOTERMES, Sterzel.

This genus is founded upon the fossil wing of a term
Lugau. From the description given of the wing it is p
allied to *Calotermes.*

Genus HODOTERMES, Hagen.

Bericht d. K. Akad. Berlin, 1853.

Head large, circular, with the median suture behind bra
across towards the eyes; eyes oval, small, facets coarse, n
jecting on the sides of the head; ocelli wanting: clypeus
convex; labrum small, shell-shaped; antennæ a little longe
the head, 21-27-jointed; jaws short, powerful, toothed.
thorax small, as large as the head, broader than long,
shaped. Wings small, four times as long as broad, tw
length of the body. Tibiæ with five spines. Venation
wings similar to that of *Calotermes,* broad from the
Abdomen somewhat broader than the thorax, flattened
dorsal surface; anal appendages cone-shaped.

In their habits the species resemble *Calotermes.* Seven
have been described from Africa; four fossil species from
[redacted]

Genus STOLOTERMES, Hagen.

Mon. Linn. Ent. xii. 1858, p. 105.

Allied to *Hodotermes*, but having only about half the number of joints in the antennæ. Ocelli present. Prothorax heart-shaped; first tarsal joint as long as those following. Venation of the wings as in *Hodotermes*, but the straight median nervure somewhat like that of *Eutermes*. Habits resembling *Calotermes*.

STOLOTERMES BRUNEICORNIS, Hagen.

Mon. Linn. Ent. xii. 1858, p. 105, Tab. ii. f. 5.

Dark brown; mouth parts, basal joints of antennæ, under surface of head and legs lighter coloured; wings fuscous, with the nervures a little darker; head and thorax smooth and shining: the whole insect rather long and thickly covered with hairs. Length to tip of wings 6½, to tip of body 3 lines.

Head small, circular, sloping in front, with a distinct median suture, summit rugose. Eyes round, large; ocelli in front of the inner margin of the eye; a large indistinct central false ocellus-like spot. Antennæ 16-jointed; first two cylindrical, of equal length; the last oval, the rest cone-shaped. Clypeus small, short, labrum circular, mussel-shaped. Prothorax much smaller than head, broader than long, flat, rounded behind, contracted slightly in front. Wings long, four times as long as broad; scapular shield truncate, with five branches: costal and subcostal nervures connected by 7-9 very sharp transverse parallel nervures, sometimes forked; first two basal ones not springing from subcostal; median nervure running through the centre of the wing, with from 7-9 oblique nervures; submedian nervure very short, turned down, with four short thick nervures. Legs robust; thighs broad; tibiæ long, with two spines at the apex; tarsi one-third the length of the tibiæ, the last joint a little longer than the first three combined; plantula present. Abdomen broader than thorax, oval; cerci large, cone-shaped; anal appendices in the male long, slender.

Hab.—Tasmania.

The above description is compiled from Hagen, who st
he has seen three dried specimens in the Berlin Museum

STOLOTERMES RUFICEPS, Brauer.

Reise Novara, Zool. Th., Neuroptera, p. 46.

(Pl. XXXVI. figs. 2-2*a*.)

General colour dark reddish-brown, the under surfa
lighter, base of the joints of antennæ fuscous. Length t
of wings $5\frac{1}{2}$, to the tip of body $3\frac{1}{2}$ lines.

Head spherical; convex on the summit, rounded from
to behind the eyes. Eyes large, projecting, coarsely
ocelli wanting. Antennæ long, thickest towards the
jointed, springing from cleft in front of the eyes; 1st a
joints stout, cylindrical; 3rd very short; 4th-6th truncate
extremities, narrowest at the base; 7th to tip broad oval;
rounded at apex. Clypeus small, rounded in front; labru
broad, rounded at tip; palpi rather short; jaws large, sto
three small rather blunt teeth near the tip and one simil
distance lower down, the base rounded. Prothorax narr
as broad as the head, broader than long, almost truncate i
rounded on the sides, sloping to the hind margin, which is
arcuate in the centre, flattened on the summit, with a

from a cleft in front of the head, 15-jointed, the basal joints as in the winged insect, with the apical joint stouter and not so stalked; clypeus small; labrum broadest at base, rounded on the sides to a rounded tip; jaws stout at the base, curved in at the tips, and crossing each other in the middle, with two broad angular teeth in the centre. Prothorax not as broad as the head, arcuate and broadest in front, rounded and sloping sharply on the sides to the apical margin; legs short; thighs very thick; tibiæ slender, with the two inner spines at base very close together; abdomen rather large, oval; cerci small.

Hab.—Drury, New Zealand (Captain T. Broun).

I have no workers in my collection, all other examples sent with the soldiers being pupæ with short wing-cases.

Spirit specimens of this species were sent to me by the Government Entomologist of New Zealand, but without any notes upon their habits.

The soldiers are remarkable for their distinctly faceted eyes, though some species of the Hodotermes group are also known to have soldiers provided with eyes. In an African termite (*Hodotermes havilandi*) which is figured in the Cambridge Natural History, and described as going about in the bright sunlight, similar eyes are very distinct.

RHINOTERMITINÆ.

Genus RHINOTERMES, Hagen.

Head as broad as long; forehead flattened, with a parallel cleft through the centre of the rhinarium, which projects slightly in front, forming with the lobed clypeus a snout-like process. Eyes small, coarsely faceted; ocelli present, with a circular false ocellar spot in the base of the cleft: antennæ 20-jointed. Prothorax not as wide as the head, rounded in front. Legs stout, with two spines at the apex of the tibiæ; plantula wanting. Wings short and broad, rounded at the tips; scapular shield short and broad, swelling out and slightly convex at the cross suture; costal and subcostal nervures stout, well separated at the base,

Cuba, Surinam, and Brazil. A fourth species was
Brauer from Australia. The members of the Aust
live in communities like *Calotermes*. On account o
veins between the costal and subcostal nervures
them in a separate subfamily.

RHINOTERMES RETICULATUS, n.sp.

(Pl. XXXVI. figs. 3, 3*a*, 3*b*, 3*c*.)

Upper surface pale ferruginous, ventral surface
wings light reddish-brown, semitransparent, ner
Length to tip of wings 5½, to tip of body 3 lines.

Head slightly broader than long, broadest behi
on the sides in front of the eyes, and truncate
flattened on the summit. Eyes small, not projec
faceted; ocelli very small, in front of the eyes,
Antennæ 20-jointed, springing out of a deep anter
joint large, cylindrical; 2nd about half the len
smallest; 5th-20th moniliform, increasing slightly i
more stalked to the tip; the terminal one round
rather hairy. Clypeus large, truncate behind, divi
cleft which proceeds from the front of the foreh
commences in a small rounded spot in a line wi
labrum spade-shaped, rounded at the tip, longer tha
thick and stout, sharply curved in at the tip, wi

nervures thick, running parallel to each other and curving round at the tip, without true cross veins, but with a number at the extreme tip forming irregular cells; median nervure slender, irregular, crossing the middle of the wing, turning downward and branching into three oblique forks, the first again bifurcated, the second simple and the last again forked; submedian running parallel with median to middle of wing, turning downwards, with eight oblique branching veinlets not always regular. Abdomen short, broad, rounded at the tip; cerci short and stout.

Soldier.—Head pale yellow, darkest towards jaws which are ferruginous; the rest dull white. Length 3 lines. Head large, short and broad, flattened on the summit, rounded on the sides, and sloping up in front from the deep antennal cleft to the base of jaws; forehead truncate, with a sharp canal cut out in the centre, forming a short gap with a circular spot or opening at the base: clypeus concave behind, rounded on the sides and narrowest in front; labrum very long, reaching to the tip of the closed jaws, broad at base, contracted towards the middle and swelling out into a rounded spatulate lobed tip; jaws short, stout, sharply turned over each other at the apex, with two sharp teeth below on the left fang and a single one on the right. Thorax smaller than head, with the prothorax more saddle-shaped than that of the winged ones; legs rather slender; abdomen short and broad, the slender anal appendices showing beyond the tip; cerci hairy.

Soldier (minor).—In this species a second form of soldier is always present in about equal numbers with the larger ones. In general structure they are similar, but with all the parts more slender and elongated; length 2 lines. Apical portion of head bright yellow, base much lighter; head broad at the base, sloping to base of the jaws, of a somewhat elongated pear-shape; jaws much elongated, slender, turning over at the tips; palpi nearly as long as jaws; antennæ 16-jointed; labrum very slender, but similar to that of the large soldier.

Worker dull white, lightly tinted with yellow behind the jaws; 2 lines in length. Head very large and broad, sloping round at

much smaller than the head, with a fine median sutu[r]
from the base through the meso- and metathorax ; abd[omen]
swollen in the middle, broadly rounded at the tip.

Hab.: Kalgoorlie, W.A. (Mr. G. W. Froggatt; f[...]
Palm Creek, Central Australia (Prof. Spencer, Horn E[...]

Specimens of these termites were taken by my fathe[r]
sheoak (Casuarina) stump towards the end of March; [...]
time the winged ones were more plentiful than the w[...]
soldiers. In their habits and general appearance the[...]
Calotermes, and take the place of the eastern specie[s]
medius; both are plentiful in their districts.

RHINOTERMES INTERMEDIUS, Brauer.

Reise Novara, Zool. Th., Neuroptera, p. 49[...]

Upper surface pale ochreous, lighter coloured at t[...]
head and thoracic segments; under side, legs, and an[...]
yellow; wings pale ferruginous, semitransparent, nervu[...]
Length to tip of wings 7, to tip of body 4 lines.

Head similar to that of *R. reticulatus*, but with the[...]
larger and more prominent; ocelli larger. Antennæ [...]
20-jointed. Clypeus broader and not quite so convex. [...]
broader and more deeply concave in front behind [...]
Legs longer and tibiæ more slender. Wings thrice [...]
broad, larger, and lighter coloured, but with the[...]
identical

along the grain of the wood, and retreating into the log when disturbed. They are at once recognised by the large broad heads of the soldiers and the presence of two different forms of soldier.

The soldiers, like those of *Calotermes*, are very timid, never showing fight, but hurrying away to shelter when disturbed, the little soldiers being much the braver. I had never been able to find the winged forms in our nests, but my friend Mr. Gilbert Turner, of Mackay, was more fortunate, sending me down several winged ones with workers and soldiers

Early last year Mr. N. Holtze sent me a small bottle full of winged ones that had been taken flying round the lamps at Palmerston, Pt. Darwin. This species was described by Brauer, the locality given being Sydney, N.S.W., but in a specimen sent from the Vienna Museum, where his types are, the label attached says, "Thorey, Cape York, 1868."

Hab.—Sydney and Newcastle, N.S.W. (W. W. Froggatt); Mackay, Queensland (Mr. G. Turner); Port Darwin, N.T. (Mr. N. Holtze, Botanic Gardens).

GLYPTOTERMITINÆ.

Genus GLYPTOTERMES, g.n.

Head broad; eyes moderately large, coarsely faceted; ocelli close to the eyes; antennæ short, 13- to 15-jointed, springing from a circular cleft in front of the eyes. Prothorax convex in front, rounded on the sides and convex behind, with a slight median suture. Legs stout and rather short, with short thick spines at apex of tarsi; plantula small. Wings slender, thrice as long as broad; scapular shield small and angular showing the base of four nervures: costal, subcostal and median nervures running close to each other through the upper half of wing, subcostal generally merging into the costal in the centre, but always separated at the extremities; submedian running through the centre of the wing; it and the oblique nervures often composed of fine dots.

Small dark-coloured termites, with clouded opaque wings, living in small communities in the trunks and bark of trees; soldiers very few; these and the workers slender and cylindrical.

Glyptotermes tuberculatus, n.sp.

(Pl. xxxv. figs. 9, 9*a*.)

General colour pale ochreous; legs and antennæ paler; wings vitreous, with the nervures fuscous at base and light ferruginous towards the tips. Length to tip of wings 6, to tip of body 2¼ lines.

Head broader than long, broad behind, almost quadrate, truncate in front, convex on the summit. Eyes standing out on the sides of the head, large and circular, coarsely faceted; ocelli round, in line with the apical margin of eyes. Antennæ short, rather hairy, springing out of a deep antennal cleft in front of the eyes, 15-jointed; 1st stout, cylindrical; 2nd and 3rd shorter, cylindrical, broadest at apex; 4th-14th short, broad, cup-shaped, rather broader towards the extremities, with the last joint oval. Clypeus rounded behind, produced into flanges on the side, narrower, truncate and quadrate in front; labrum broad, rounded in front, shell-shaped; jaws rather stout, with three sharp teeth at the tip; palpal joints very short and oval. Prothorax quadrate, slightly turned up on the edge, slightly concave in front, straight on the sides, truncated behind, with a depression in the centre [redacted]

parallel with it to the tips; the whole of the wings
overed with scars or pustules. Abdomen elongate-oval,
erci short and stout, well under the abdomen; anal
s wanting.

—Head bright reddish-brown, jaws black, labrum
rothorax ochreous, the rest dull yellow. Length 3 lines.
tle longer than broad, cylindrical, sides straight, sloping
ehind the base of the antennæ to the centre where the
s deeply cleft, forming a rounded hollow with a stout
protuberance on either side, and truncate below, and
ng clypeus, which is small and indistinct; labrum large,
spatulate, finely fringed with hairs; antennæ springing
circular pit in line with the base of jaws, 15-jointed;
t, ferruginous and very stout at the base, meeting at the
two stout angular teeth below the tip on the left side,
n the right side smooth to apex of labrum, where there
rge tooth. A stout cylindrical finger-like projection
t on either side of the apical margin of head in front of
nal cleft. Prothorax saddle-shaped, slightly arcuate in
nded on sides, and sloping back to apical edge which is
oncave in the centre; a fine median suture running
he head and whole of the thorax; thorax and abdomen
a cylindrical body, narrowing towards the tip, rather
s short and stout.

· about the same length and shape as the soldier, with
tion of the head which is almost spherical; labrum

Glyptotermes iridipennis, n.sp.

(Pl. xxxvi. figs. 5, 5*a*.)

Castaneous to piceous, antennæ and legs dark ochreous, the wings deeply clouded with pale reddish-brown, nervures reddish-brown. Length to tip of wings 5½, to tip of body 2¾ lines.

Head longer than broad, widest behind, convex on the summit, and sloping down on forehead. Eyes small, round, rather coarsely faceted, on the sides of the head projecting very slightly; ocelli round, not contiguous but in line with centre of eye. Antennæ short, stout, and rather hairy, springing from a circular antennal cleft in front of eyes, 15-jointed; 1st stout, cylindrical; 2nd and 3rd smaller; the rest thickened, stout, pyriform; terminal joint oval. Clypeus large, quadrate; labrum convex on summit, broader than long, rounded in front. Prothorax rather broader than head, deeply concave in front, rotundate with the sides flanged and the apex rounded. Legs short, thighs broad and stout; tibiæ stout, cylindrical, broadest at the tips, with three short stout spines beautifully serrate on the edges; tarsi rather long, the terminal joint as long again as the first three combined, claws slender, plantula small. Wings slender, four times as long as broad, rather pointed at the tip; scapular shield long narrow,

[redacted]

Hab.—Frankston, Victoria (Mr. W. Kershaw, National Museum).

This species is described from a single pinned specimen in good preservation; and is very distinct from any other species known to me.

GLYPTOTERMES BREVICORNIS, n.sp.

(Pl. XXXVI. figs. 6, 6*a*).

Upper surface pale ochreous; wings semitransparent, nervures brown tinged with yellow; under surface, legs, and antennæ stramineous. Length to tip of wings 5, to tip of body $2\frac{1}{2}$ lines.

Head a little longer than broad, rotundate, broadest between the eyes, rounded on the summit, with a slight median suture at the base. Eyes small, circular, not very prominent; ocelli oval, contiguous and in a line with the apical margin of the eyes. Antennæ 13-jointed, 1st joint large, cylindrical; 2nd shorter, cylindrical; 3rd-4th orbiculate; 5th-12th turbinate; the terminal one oval. Clypeus widest behind, narrow, truncate in front, sloping back on the sides; labrum broad, rounded on the sides, and rather truncated in front; jaws broad, with three short blunt teeth at apex, the edge roughened towards base. Prothorax not as broad as head, concave in front, rotundate on the sides and behind, with a slight depression at the apex, a dark median line running from the base through the meso- and metathorax. Legs short and thick, thighs large; tibiæ slender, armed with five stout spines at the apex; terminal joint of tarsi large; claws large; plantula small. Wings slender, twice as long as broad; scapular shield slender, rounded at the cross suture, clouded with fuscous extending into the base of the wing; costal, subcostal, and median nervures running parallel, close together, the last extending a little further round the tip of wing; submedian opaque at base, running through middle of wing, with three stout oblique nervures at the base, the apical one indistinct, about eleven in number, forming slender dotted nervelets turning downwards; the whole of the wings covered with minute spots

or scars. Abdomen broad, elongate, rounded at the tip; cerc short and stout.

Soldier.—Head pale ferruginous at base, becoming much darker towards the antennæ; jaws castaneous at base to black at tips; upper surface of thorax and legs pale ochreous, the rest dirty white. Length to tip of body 3½ lines. Head twice as long as broad, rounded behind, straight upon the sides, broadest at base of jaws, flat on the summit and sloping down sharply in front, irregularly roughened; with a median suture dividing in front and running out on either side at base of antennæ; antennæ 13-jointed, short, not reaching beyond tip of jaws; clypeus small, flattened, slightly rounded in front; labrum almost quadrate, lying between the base of jaws, thin and shell-like; jaws very short, broad at the base, irregularly toothed, straight on the sides, curved at tip and just crossing each other, with three small angular teeth below on the left jaw and two larger ones on the right. Body long and cylindrical.

Worker.—Head and prothorax pale yellow, the rest white. Length to tip of body 3 lines. Head spherical, showing pale median and transverse sutures, and a dark mark along apical margin on either side in front of base of antennæ. Body long, cylindrical and rather hairy.

ɔm an antennal cleft between the eyes; 1st joint stout, ·ical; 2nd shorter; 3rd rather pear-shaped; 4th-13th larger, late, becoming more turbinate towards the tip; terminal one ɜd. Clypeus broad and short, truncate behind, overlapping oad bilobed labrum; jaws small, straight on the sides, with) curved in, a sharp tooth below, widely separated from the Prothorax nearly as broad as head, broader than long, ve in front, rotundate on the sides and slightly hollow l, a slender median suture at base to the apex of metathorax. short and thick; thighs broad, rounded; tibiæ with three spines at apex. Wings slender, four times as long as broad; lar shield small and slender, fuscous, the colour extending he base of wings, the cross suture straight: base of subcostal ewings robust, with a short nervure running out of scapular and turning up into costal just beyond the suture; costal ıbcostal only separated from each other at the extremities; ɜdian stout at base, running through the middle of wing, five or six opaque oblique nervures emerging from basal n and six or seven finer and longer ones towards apex, all more or less irregular from the many little dots covering ·ings. Abdomen long, slender, rounded at tip; anal dices very long and slender, close to the tip of abdomen; short and stout.

liers.—Head pale reddish-yellow, the rest white. Length es. Head longer than broad, rounded behind and straight ː sides, emarginate in front at the base of jaws, truncate on ·ad and rugose above clypeus; median and transverse sutures ct, the latter running out on either side to base of antennæ; ıs hidden; labrum broad, rounded in front and on sides, ssed in the centre and fringed with fine hairs; jaws very at base, short, rounded, turning over each other at the tips, three sharp angular teeth. Abdomen long, slender, and lrical, tapering at the tip; cerci short and stout.

ɔrker of a general dull white colour; head faintly tinged with w; abdomen in life reddish-brown from the food eaten

showing through the semitransparent skin: head spherical, s
ing two lobes on forehead, rounded towards the base of ante
with a dark spot on either side of clypeus; prothorax smaller
head, the rest of thorax and abdominal segments rounded, sle
and cylindrical to the tip.

Hab.—Sydney, Botany and Hornsby (W. W. Froggatt).

About Sydney this species is only found by cutting off the
bark upon the trunks of *Eucalyptus robusta*. The insects
upon the inner bark, and sometimes on the living sap w
evidently as a general rule gnawing a passage through t
behind, as there are always several tunnels leading inwards in
trunks, which are nearly always rotten and decayed in the cen
They live in small communities of from fifty to a few hun
individuals, the majority being workers or larvæ, with someti
only one or two soldiers in the colony. Except in the head,
soldiers closely resemble the workers, and try to hide as soo
they are exposed. They form very slender tubular tunnels
all directions in the bark, each individual burrowing on
own account, no room being left to allow of their passing e
other. The winged ones are very small in comparison with
workers and soldiers. Some well developed pupæ were obtai
in a rather numerous colony in a dead tree (the only time I e
found them away from the living trees), and these matured to

HETEROTERMES PLATYCEPHALUS, n.sp.

(Pl. xxxv. fig. 10; Pl. xxxvi. fig. 4.)

General colour castaneous, legs brown, labrum ochreous; antennæ barred with white at the apex of each segment; wings pale fuscous with the nervures brown. Length to tip of wings 6, to tip of body 2½ lines.

Head very large, longer than broad, almost quadrate, rounded behind and straight on the sides to well in front of the eyes, flattened upon the summit, slightly arcuate behind the clypeus. Eyes small, circular, well down on the sides of the head, not projecting; the ocelli wanting. Clypeus large, prominent, and rounded on the sides and apex, very slightly concave in front, with a median suture through the centre dividing it into two lobes; labrum broad, rounded in front. Antennæ 16-jointed, long, with large thickened segments, springing from in front of eyes; 1st joint long, cylindrical; 2nd and 3rd very small; 4th-15th increasing slightly in size towards the tip; terminal joint oval. Thorax covered with long scattered grey hairs; prothorax not as broad as head, truncated on the sides, rounded and arcuate in the centre of both base and apex. Legs short, robust; tibiæ broad at tip, with four slender spines; tarsi slender. Wings nearly thrice as long as broad, rounded at the tip; scapular shield slender, hairy, angular, showing the base of four nervures; costal and subcostal nervures running very close together to tip; median nervure very fine, running close to subcostal, divided and turning down at the tip: submedian fine, with seven thickened oblique nervures; the first two very small; the 3rd, 4th, 6th, and 7th furcate, with four or five slender oblique apical nervelets. Abdomen short, elongate and oval at the tip.

Hab.—Kangaroo Island, S.A. (Mr. J. G. O. Tepper).

I have one mounted specimen from the Adelaide Museum. It is a very curious form differing from all other species in the long quadrate head and thick antennæ. There are also four specimens of this termite in the Macleay Museum, labelled South Australia.

EXPLANATION OF PLATES.

Plate xxxv.

Fig. 1. —Forewing of *Calotermes irregularis*, n.sp.
Fig. 1*a*.—Hindwing of ,, ,,
Fig. 1*b*.—Head of soldier of *Calotermes irregularis*, n.sp.
Fig. 2. —Forewing of *Calotermes adamsoni*, n.sp.
Fig. 2*a*.—Hindwing of ,, ,,
Fig. 2*b*.—Head of soldier of *Calotermes adamsoni*, n.sp.
Fig. 3. —Forewing of *Mastotermes darwiniensis*, n.sp.
Fig. 3*a*.—Head of ,, ,,
Fig. 4. —Forewing of *Calotermes insularis*, White.
Fig. 5. —Forewing of *Glyptotermes eucalypti*, n.sp.
Fig. 5*a*.—Head of soldier, ,, ,,
Fig. 7. —Head of soldier, *Calotermes longiceps*, n.sp.
Fig. 8. —Forewing of *Calotermes robustus*, n.sp.
Fig. 9. —Forewing of *Glyptotermes tuberculatus*, n.sp.
Fig. 9*a*.—Head of soldier, ,, ,,
Fig. 10. —Head of *Heterotermes platycephalus*, n.sp.

Plate xxxvi.

Fig. 1. —Forewing of *Calotermes Browni*, n.sp.
Fig. 1*a*.—Head of soldier, ,, ,,
Fig. 2. —Forewing of *Stolotermes ruficeps*, Brauer.
Fig. 2*a*.—Head of soldier, ,, ,,
[redacted]

THE OCCURRENCE OF RADIOLARIA IN PALÆOZOIC ROCKS IN N.S. WALES.

By Professor T. W. Edgeworth David, B.A., F.G.S.

(Plates xxxvii.-xxxviii.)

Contents.

1. Bibliography.

The first reference known to me as to the occurrence of radiolarian rocks in Australia is in a paper by Dr. G. J. Hinde, F.R.S.*

This rock was obtained by Capt. Moore, of H.M.S. "Penguin," about 1891, from Fanny Bay, Port Darwin. "The rock in question is of a dull white or yellowish white tint, in places stained reddish with ferruginous material; it has an earthy aspect like that of our Lower White Chalk, but it is somewhat harder than chalk, though it can be scratched with the thumb-nail. There are no signs of stratification, and it appears as a fine-grained homogeneous material." Under the microscope the groundmass is seen to be made up of minute granules and mineral fragments, isotropic for the most part, being probably amorphous silica. The minute grains, however, and angular particles polarize: some appear to be quartz, others rutile. The organic structure

* Q.J.G.S. Vol. xliv. No. 194. May 1st, 1893. Dr. G. J. Hinde. Note on a Radiolarian Rock from Fanny Bay, Port Darwin, Australia.

of the granules is only very faintly marked. The orders of Prunoidea, Discoidea and Cyrtoidea are all represented The geological horizon to which they belong is very probably that of the Desert Sandstone Formation (Upper Cretaceous).

What is probably an equivalent of this rock has been described by the Rev. J. E Tenison Woods* as follows :—

"What we find whenever a good section is exposed is this—a layer of loose white, or red, decomposed rock or rubble, some 3 or 4 feet thick, lies on the upturned edges of the slates. Above this a layer some 2 feet thick of loamy earth, which has been surface soil. Above this from 14 to 120 feet of magnesite or carbonate of magnesia, more or less impure, with silicates of alumina and iron, and mere traces of lime. Not often is it pure white, for the stains of brown, red and purple, from iron oxide, permeate the whole."

The above statement by the Rev. J. E. Tenison-Woods, as far as can be ascertained, refers to a rock identical with that which has now been proved to be, not a magnesite, but a radiolarian rock.

Reference may here be made to a note by Dr. Hinde† in which he describes a cherty rock from South Australia, which although derived from sponge spicules rather than radiolaria, yet contains globules of opal silica which might easily be mistaken for

ules and quartz grains are imbedded appears to be mainly of orphous or opal silica, nearly entirely neutral to polarized it between crossed Nicols, and it is principally in the form of y minute globules or discs usually aggregated together so as exhibit a microscopic botryoidal appearance, the globules or scs varying from ·01 to ·03 mm. in diameter. The globular rm of opal silica is similar to that which occurs in many of the onge-beds of the Upper Greensand in this country, and there in hardly be any doubt that in this Australian Chert it is due, s in the Chert of this country, to the solution and redeposition f the organic silica of the sponge-spicules."

As far as I am aware, the above are the only references to he occurrence of radiolarian rocks in Australia; and in both ases it would appear that the rocks mentioned are of late Iesozoic age.

Before proceeding to describe the horizons where radiolaria ave recently been observed by me in Palæozoic rocks in N.S.W., might be of interest, in view of the grand scale on which the adiolarian rocks are now known to be developed in this colony, nd in view also of the fact that some of the literature relating radiolaria is rather inaccessible to Australian geologists, to iefly summarize the more important works relating to Palæozoic d Mesozoic radiolaria in Extra-Australian areas.

Radiolaria have been described by Dr. D. Rüst* from Mesozoic cks, the Gault of Zilli, and the Neocomian of Gardenazza. ie radiolaria in the best state of preservation were those found the Cretaceous Coprolite Beds of Zilli, in Saxony. These diolaria have been admirably figured and described by this server.

Dunikowski has described perfect forms from the Lower Lias the Austrian Alps; while Hantken believes that certain liceous limestones with *Aptycus*, of Upper Jurassic age, in entral Europe are almost entirely formed of radiolaria.

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* Palæontographica. Vol. xxxi. 1885, and *ibidem* Vol. xxxiv. pp. 181-3. Pls. xxii-xxix., 1888, and Vol. xxxviii., 1892.

Gumbell cites them from the St. Cassian beds; and \
detected their remains in the Infra-Lias.

Radiolaria have been described by Dr. Geo. J. Hind
F. L. Ransome* from Angel Island from Mesozoic (?) r

Radiolaria have been described from Jurassic or old
the coast ranges of California by Fairbanks.†

Radiolaria have been described from Palæozoic ro
following :—Shrubsole has recorded them from the Car
rocks of Great Britain.

Dr. G. J. Hinde‡ has described radiolaria from the
Caradoc rock at Corstorphane, in the S of Scotland.

The same author has described radiolaria from C
cherts at Mullion Island, Cornwall, England.§

Perhaps the most important contribution to our kn
the Palæozoic radiolaria is that of Dr. Rust,|| and, as r
has an important bearing on the radiolarian rocks of A
take the liberty of making abstracts from it.

In the *phosphorite* from the Petschora in the S. U
well preserved radiolaria in the form of deep black fli
in a bright brown translucent base. Flinty material
are present in the phosphatic limestone. In cases the
are represented by casts only. In the whetstone an
radiolaria are badly preserved.

[redacted]

The red jasper from Sicily contains numberless radiolarian shells, coloured red, in a translucent siliceous groundmass.

Fairly well preserved radiolaria have been found in red jasper of Lower Devonian age.

At Cabrières, in Languedoc, a very hard black siliceous schist of Ordovician age contains radiolaria, mostly in a bad state of preservation. In the phosphorite of Cabrières, however, dark, porous to dense, concretions contain numerous radiolaria.

The following is an analysis of the phosphorite :—

Water	1·08
Lime phosphate	73·65
Silicate alumina	25·27
	100·

The radiolarian shells were black, yellow, or colourless. No sponge spicules were present. In pieces of rock (siliceous shale) from Saxony, poor in radiolaria, fragments of graptolites are numerous.

Black radiolarian fragments have been observed in fairly hard clay shale of Cambrian age. Others occur in flinty pebbles, but not sufficiently well preserved to admit of the species being determined. Fragments of graptolites and graptogonophores were associated.

The fact must be emphasized that it is chiefly in concretions containing phosphoric acid that the radiolaria are best preserved.

It often happens in all flinty rocks, not only Palæozoic but also Mesozoic, that the quartz filling the original hollows of the radiolarian shells shows a radial habit, and has the form of perfect spherulites exhibiting dark fixed interference crosses in polarized light when the objective is rotated.

In most cases the latticed shell has disappeared. Occasionally, however, the pore openings of the shell are preserved, or one sees a dark circle bounding a clear space, with small regularly placed dark indentations on the inner side.

Very often perfect crystals are developed inside and around these little quartz spheres. Generally these are opaque

octahedra of magnetite and clear or dark yellow rhombohedra of calcite. These crystals are seldom observable in the Silurian forms, and are not visible in the Devonian. Very little other organic remains are associated with the radiolaria. Only sponge spicules, belonging to the Hexactinellidæ, are found associated with the radiolaria, sometimes in great numbers.

Isolated examples only of foraminifera are met with in the siliceous limestone of the Muschelkalk. In the Silurian siliceous shales of Langenstriegis, Rehan and Steben fragments of graptolites and gonophores are not infrequent.

Plant remains. Prickly macrospores occur in the radiolarian rocks of the Jura as well as in the Carboniferous siliceous schists of the Hartz Mts. These were found in great abundance in a Lower Silurian limestone from Koneprus in Bohemia, in which hitherto radiolaria have not been detected.

Another important contribution to the knowledge of Palæozoic radiolaria is that by Hinde and Fox*, from which the following abstracts may be made.

Radiolaria occur at Codden Hill. The Codden Hill beds have a baked appearance, are whitish, buff, or dark grey in colour, and have frequently a chertoid texture, consisting of thick shales and fine-grained grits.

In places in the radiolarian chert wavellite is developed along the

s the rock is platy, siliceous, or mottled white and
e soft grey to white beds are very rich in radiolaria.
tegrate in some cases in water into a fine cream-coloured

t beds are of much less frequent occurrence than the
s.

vidual radiolarian beds are minutely laminated.

pic character.—Carbonate of lime is conspicuous by its
The radiolarian rock generally shows a siliceous ground
ome cases clear and transparent, in others dark and
m the presence of fine particles of carbonaceous or
nerals, and minute crystal needles of rutile and zircon.
us groundmass shows between crossed Nicols the faint
ppearance of cryptocrystalline silica, like flint from
hen radiolaria are abundant chalcedonic tints prevail.
laria in the rock have been filled with clear nearly
t silica free from the rutile crystals and from the dark
disseminated in the groundmass, and either micro-
or cryptocrystalline. Within the radiolarian casts
is often fibrous radial, and so shows a black cross in
ight.

re distinctly crystalline character of the radiolarian
tates their recognition in the rocks with a clear ground-
e in ordinary light they are scarcely visible, but between
ols they appear as so many circles of speckled or bright

In some of the harder and more cherty beds very minute bodies like those in the Pre-Cambrian phthanitic quartzite of Brittany are noticeable, ·006 to ·013 mm. There is no evidence to show that these are organic.

Under favourable conditions of light the latticed structure of the radiolarian shells can be distinctly seen in the coarse material resulting from the disintegration of the soft shales in water.

A few minute dentated plates, perhaps radulæ of gasteropods, of dark brownish tinge are associated with the radiolaria. Detrital fragments, except mica flakes, are either wholly wanting or extremely minute, ·03 to ·065 mm. in diameter.

Rarely limestone is associated with the radiolarian rock, and in the limestone are casts of radiolaria in calcite and also of sponge spicules. Entomostraca, crinoids, and *Endothyra* contribute to form limestones near this radiolarian horizon.

In the majority of the Culm siliceous rocks the radiolaria are now in the condition of solid casts of the original forms; their skeletal walls have entirely disappeared, and the individual casts are only bounded by the siliceous matrix of the rock, and are without definite even outlines. In such instances only the size and general form *with the radial spines* can be distinguished.

In some cases the tests have been naturally stained a brown or amber tint, and in such cases the latticed character of the shell

ALITIES AND GEOLOGICAL HORIZONS OF RADIOLARIAN ROCKS IN NEW SOUTH WALES.

he exception of the opal rocks which contain numerous casts, possibly of radiolaria, all radiolarian rocks at nown in N.S. Wales are of Palæozoic age. Radiolarian re so far been discovered by me in N.S. Wales at four localities—(1) Bingera, (2) Barraba, (3) Tamworth, (4) Caves. (See Map, Plate XL., fig. 3.)

an. (?)—(1) Bingera and (2) Barraba. In my Address* to ety in 1894, I stated "in the New England District of les possibly the red jasperoid shales of the Nundle and Districts with the associated serpentines may represent abysmal deposits, as has been suggested by Captain for similar rocks in the Maitai Series of New Zealand, ne red claystone represents rock locally metamorphosed contact with the serpentines."

reading the above Address, as opportunity offered, I have e to time studied the red jaspers of Barraba and Bingera, s of microscope sections. These revealed the presence of s spherical bodies composed of translucent chalcedony, ed through an opaque groundmass of red jasperoid material. red probable that these were internal casts of radiolaria, evidence was inconclusive. Last January, through the of Mr. J. J. H. Teall, F.R.S., I was allowed to examine ully prepared microscopic sections of the Lower Silurian an cherts from Mullion Island, off Cornwall, and from n of Devonshire, as well as sections of red radiolarian om the Antarctic regions. It was at once obvious that mentioned rock in particular closely resembled the and Barraba red jaspers. On my return to Sydney, last vith the help of the third year University students, I my examination of the New England red jaspers. Dr.

* P.L.S.N.S.W. Ser. 2, Vol. viii. p. 594.

G. J. Hinde had placed at my disposal, on leaving England, valuable collection of British Palæozoic radiolarian rocks, whic proved of the utmost use for purposes of comparison. A larg number of sections of the red jasper proved conclusively that radiolarian rocks were developed on a large scale both at Barraba and Bingera. It is the opinion of Mr. E. F. Pittman, the Government Geologist, that the red colour of the jaspers was the original colour of the beds at the time of their deposition and that it is not due simply to contact metamorphism. A collection of specimens kindly made for me by Mr. Pittman confirms this theory. The question as to whether these red jaspers are altered "red clays" of deep sea origin will be discussed later. The geological horizon of the red jasper may be provisionally placed somewhere in the Devonian System, perhaps in the Middle Devonian, homotaxial with the Burdekin formation of Queensland.

Lepidodendron Australe occurs in some quantity in rocks which seem to be somewhat newer than the radiolarian beds; but it appears to be represented sparingly, almost, if not quite, as low down as the horizon of the radiolarian rock. This, however, is not yet an established fact.

(3) Tamworth.—Traced southwards, the radiolarian beds have recently been found by me to attain a remarkable developmer ...ighbourhood of Tamworth. They there consist ...areous rocks, fine grained blacki ...

The limestones have been considerably altered by contact with the New England granite. The claystones and cherty rocks both above and below the limestones have also been much altered by innumerable granite sills for a zone over five miles in width, measured at right angles to the junction line between the sedimentary rocks and the granite. A lamination, coincident with the planes of bedding, has been superinduced in the claystones. The sills vary from a fraction of an inch up to several feet in thickness, and at first sight had every appearance of being regularly interstratified with the sediments. A careful examination, however, at once revealed their intrusive character, as they trespass slightly across the planes of bedding and have slightly altered by indurating and developing chiastolitic minerals, the sedimentary rocks both above and below them. The claystones and cherts dip chiefly westwards at angles of from 45 to 60°. At Tamworth Common the dip is W. 20° S. at 52°. Radiolaria are abundantly distributed through these claystones and cherts in the form of chalcedonic casts. Associated with the claystones is the siliceous calcareous rock previously referred to. A good section shewing it *in situ* is exposed at the quarries on the Tamworth Temporary Common. The chief bed is about 18 inches in thickness. It weathers superficially into a soft brown friable rock of the colour of Fuller's earth, much resembling bath-brick. Fresh fractures, of unweathered portions, shew the rock to be bluish-grey and compact. If a surface of the unweathered portion be smoothed and polished and then etched with dilute hydrochloric or acetic acid, interstitial carbonate of lime is dissolved out, and well preserved siliceous shells of radiolaria become visible. These will be described in detail later. A second bed of siliceous radiolarian limestone occurs at a point about a mile easterly from the preceding. It is a few inches only in thickness. For the general appearance of this rock see Plate XXXVII. The radiolarian rocks are probably at least 2000 feet thick at Tamworth. The distance from Bingera on the north to Tamworth on the south is 85 miles. Barraba, intermediate between these two places, is 34 miles south of Bingera and 51 miles north of Tamworth. The

radiolarian rock is almost certainly continuous from Bingera to Tamworth.

(4) Jenolan Caves.—This locality is about 200 miles south by west from Tamworth. The rocks developed in this neighbourhood are the Cave Limestone, thin grey argillites and dark grey and reddish-purple shales and black cherts with numerous dykes and sills of quartz-felsite, and basic dykes rendered porphyritic by augite. The Cave Limestone is a somewhat massive rock from 380 to 420 feet in thickness. Stratification is well marked at its upper surface. It dips W. 10° S. at 60° as shown by me this year in my Address to the Royal Society of N.S. Wales, Plate II.

The following fossils have been recorded as occurring in it by Mr. R. Etheridge, junr.*:— *Pentamerus Knightii*, J. Sowerby; *Palæoniso Brazieri*, Eth. fil.; *Loxonema antiqua*, De Kon., and a large *Favosites*.

Mr. Etheridge considers that the occurrence of the large varieties of *Pentamerus Knightii* in this Cave Limestone renders it not improbable that it approximates in age to the Aymestry Limestone of England. At the same time he comments on the fact that *Pentamerus Knightii* has not yet been discovered in the Yass beds of N.S. Wales, the horizon of which is almost certainly Upper Silurian, and *Mucophyllum crateroides*, a very characteristic and abundant coral in the Yass beds has not yet been [illegible]

l from the circumstance that nearly all the dykes to the the limestone are felsitic, while no felsite dykes occur to st of the limestone, that the basic character of the former of dykes is due to the eruptive rock having assimilated lime in its passage through the limestone bed, for as the the limestone is westerly at an angle of 60°, and the dykes arly vertical, they could not have reached the surface t first passing through the limestone bed. The dark are not distinctly cherty except where they are in close ity to the dykes. The cherty character of the beds in this due therefore, I think, to contact metamorphism rather o silica derived from radiolarian shells. Both the black and the softer and less siliceous dark grey shales abound s of radiolaria. The casts are in the best state of preservation the cherty bands. Below the Jenolan Cave Limestone eral hundred feet of dark indurated shales, greenish-grey es, reddish-purple shale and coarse volcanic agglomerates rge lumps of *Favosites*, *Heliolites*, &c. The argillites and ales contain numerous casts of radiolaria, but in a very bad f preservation.

Macroscopic and Microscopic Description of the Radiolarian Rocks.

evident that the radiolaria must in this case have contributed very largely to form the rock.

Under the microscope numerous spherical or oval bodies, from ·05 mm. to ·215 mm. in diameter, are seen to be distributed through the base. The outlines of the larger casts are jagged, the projecting points representing casts in chalcedony of the openings in the original latticed shell. Most of the smaller casts are probably those of the medullary shell. The larger casts very frequently occur in pairs. Only in one instance was the original outer shell of a radiolarian organism noticed. It was separated by an inner ring of red jasper from the cast of the medullary shell. The form appeared to be allied to *Carposphæra*. Some of the largest of the casts, about ·215 mm. in diameter, are probably referable to *Cenosphæra*. Many of the radiolarian casts have participated in the numerous minute faults to which the rock has been subjected. The Tamworth radiolarian rocks, as already mentioned, are partly thin siliceous limestones, partly argillites and black cherts, partly massive coralline limestones.

The black cherts do not appear to owe their silica entirely to the radiolaria, but to have derived it largely from the thousands of granitic sills with which they are so regularly intersected as to give the appearance of interstratification.

The casts of radiolaria in these cherty argillites are much

hen etching the slice with dilute hydrochloric acid. Much of the structure can be developed in this way as shown on Plate XXXVII., from a microphotograph kindly taken for me by Mr. W. F. Smeeth, M.A., B.E., Assoc. R.S.M.

As I have forwarded some of this material to Dr. Hinde, who has kindly undertaken to describe the radiolaria specially, I will not attempt to do more than mention that some of the commonest forms in the Tamworth rock are figured on Plate XXXVIII.

It is obvious that the legion of the Spumellaria is much better represented than that of the Nassellaria. Fig. 7, Plate XXXVIII. appears to represent a *Xiphcsphæra*, but the spines appear to be perforated by openings, giving the shell somewhat the appearance of *Pipettetella* (Challenger Reports, Radiolaria, Vol. xviii. Pl. 39, Fig. 6). Fig. 2 shows the inner and outer shells fairly well preserved, and is probably a *Haliomma*. Fig. 5 perhaps represents a *Theodiscus*; and Fig. 9 perhaps a *Staurolonche* or an *Astromma*.

As regards the state of preservation of the shells the original siliceous skeleton is for the most part represented, but is sometimes replaced by iron pyrites. Often internal casts alone, in chalcedony, are all that remain to tell of the former presence of the radiolaria. Spicules of hexactinellid sponges are visible in places, in this rock. The radiolaria are so abundant as to give this rock, when etched, the appearance of a Barbadoes earth. It was probably in its original condition a radiolarian ooze.

At the Jenolan Caves, as already stated, the radiolarian casts are best preserved in the black cherts, where they are very numerous. Numerous traces of radiolaria can also be detected in the soft argillites and hardened clay shales.

The radiolarian casts are in a better state of preservation in the black cherts than in the red jaspers of Barraba and Bingera. Latticed structure is, however, scarcely anywhere to be seen. Such slight traces of it as do occur are preserved in the form of opaque black fragments of network entangled in a sub-translucent cryptocrystalline base, as seen in thin sections under the microscope.

Casts of the inner and outer shells are well preserved in the form of a nucleus of translucent chalcedony separated by a zone of the grey base from an outer ring of clear chalcedony.

Radial spines are indistinctly visible in many of the specimens, and can be seen best under crossed Nicols. Most of the casts are spherical, and vary in diameter from ·05 mm. to ·2 mm

Internal casts of the medullary shell are more frequent than casts of the outer shell.

Sponge spicules were not observed.

4. Summary.

The radiolarian rocks, as yet discovered in New South Wales, range for at least 285 miles, from the Jenolan Caves on the south to Bingera on the north. Their total thickness has not yet been ascertained, but at Tamworth it appears to amount to at least 2,000 feet, and at Jenolan to not less than 1,000 feet. The radiolarian rocks consist of red jaspers, black cherts, thin siliceous limestones, and thin bedded argillites. The radiolaria hitherto discovered are in the best state of preservation when enclosed in the siliceous limestone. For the most part, however, they are represented merely by chalcedonic casts, the casts of the medullary shell being more frequently preserved than those of the outer

land, and Mr. R. Etheridge, Junr., consider the age of the
in beds to be Middle Devonian.

5. Deductions.

In New South Wales there is a great development of rocks, argillites, cherts and jaspers, formerly considered to be liferous, but now proved to be formed largely of the shells ine organisms, the radiolaria.

The geological horizon of these rocks is probably Middle er Devonian, perhaps Siluro-Devonian.

The cherty character of some of the rocks containing the rian casts is due rather to the introduction of silica arily from eruptive dykes and sills than to the silica conin the radiolarian shells.

The preservation of the radiolarian casts in the black is chiefly due to the silicification and induration superl by contact metamorphism.

This contact metamorphism took place some time between se of the Carboniferous Period and the commencement of rmo-Carboniferous Period, and was the result of the on of sills and dykes of granite.

(*a*) The presence of thick beds of coralline limestone intered with the radiolarian rocks, and (*b*) the vast thickness of liolarian beds (several thousand feet being formed within a

Postscript to

Note on the Occurrence of Casts of Radiolaria in Pre-Cambrian (?) Rocks, South Australia. By Professor David, B.A., F.G.S., and Walter Howchin, F.G.S. (p. 571).

Since this paper was written the authors, when examining a supposed Pre-Cambrian Area at Normanville, about 35 miles southerly from Adelaide, discovered a great number of *Archæo-cyathinæ* in a thick bed of limestone previously supposed to be unfossiliferous. This limestone dips at from 60° to over 80°, and appears to be conformable to strata which must resemble those in which the radiolarian casts have been observed at Crystal Brook and Brighton in South Australia. This discovery renders it highly probable that most of the rocks in the Mt. Lofty Range, in some of which the radiolarian casts have been found, will prove to be Lower Cambrian or referable to passage beds at the base of the Cambrian rather than Pre-Cambrian.

(To face p. 570.)

apparent that both of us had been working for some time previous on the subject of micro-organisms in the Pre-Cambrian rocks of Australia, we decided to collaborate, and accordingly have written this preliminary note.

OTE ON THE OCCURRENCE OF CASTS OF RADIOLARIA IN PRE-CAMBRIAN (?) ROCKS, SOUTH AUSTRALIA.

By Professor T. W. Edgeworth David, B.A., F.G.S., and Walter Howchin, F.G.S.

(Plates xxxix.-xl.)

CONTENTS.

1. Introduction.

Through the kindness of Professor R. Tate, of Adelaide University, one of us was enabled last December year to make a cursory examination of some of the Pre-Cambrian rocks in the neighbourhood of Hallett's Cove, about fifteen miles S.S.W. from Adelaide.

Thin sections of some of these rocks, subsequently prepared at Sydney University, showed not only well marked oolitic structure, in the case of some of the calcareous rocks, but also obscure traces of what are probably radiolaria. The latter were visible chiefly in a dark greenish-grey siliceous limestone, as well as in a very fine-grained laminated dark grey clay-shale.

A correspondence followed between us on the subject and, as it became apparent that both of us had been working for some time previous on the subject of micro-organisms in the Pre-Cambrian rocks of Australia, we decided to collaborate, and accordingly have written this preliminary note.

geological antiquity, unless an exception is made i
those recorded and figured by M. L. Cayeux,* from t
brian graphitic phthanites of Brittany.

M. L. Cayeux refers the radiolaria to no less t
genera, in which both *Spumellaria* and *Nassella*
represented. He states that the predominant genus is
The 45 figures given in his plate, drawn by an ar
never figured radiolaria, but who simply drew what
certainly extremely suggestive of the radiolarian ty
he refers them, Pl. xi., fig. 1*a*, in particular, havin
organic appearance.

Dr. G. J. Hinde† has reviewed this paper by M. C

He comments specially on the exceedingly small size
laria, ·001 to ·022 mm. in diameter.

He says *(op. cit.* p. 418), "The difference is very st
the microscope, and it may be expressed by the fa
average diameter of the 44 figured forms of which th
are given is ·0115 mm., whilst the average diameter
Palæozoic Radiolaria figured by Dr. Rüst (taking th
first described) is ·2 mm.; thus it would require t
diameters of 17 of the Pre-Cambrian bodies to reach
diameter of one of the Palæozoic Radiolaria."

Dr. Rüst, on the other hand, is inclined to refe
figured to detached chambers of foraminifera, rela
genus allied to *Globigerina*. It is clear from the

that some of the leading authorities on the radiolaria are not convinced as to the structure of the forms figured by M. L. Cayeux being correctly referred to the above group, and his further descriptions of the Brittany rocks are anxiously awaited. Reference may be made here to what have been described as other micro-organisms associated with the Pre-Cambrian radiolaria, or occurring alone.

M. L. Cayeux has described and figured what he believes to be foraminifera from Pre-Cambrian rocks at Saint Lô, at Lamballe (Côtes-du-Nord).*

He has also recorded the occurrence of remains of sponge spicules in the Pre-Cambrian rocks of Brittany.†

These were found by M. Ch. Barrois, who also discovered the radiolaria in the Pre-Cambrian rocks of Brittany, from Ville-au-Roi, near Lamballe. These remains are in the form of monaxial spicules, some being probably referable to the *Monactinellidæ*. Others M. L. Cayeux refers respectively to the *Tetractinellidæ*, *Lithistidæ*, and *Hexactinellidæ*. The spicules are from ·05 mm. to ·35 mm. in length, mostly ·1 mm. to ·15 mm. The spicules are replaced by pyrites: the particles of pyrites are held together in a siliceous setting. The canal is not preserved.

The occurrence of spicules of fossil sponges in Archæan rocks has been recorded by Mr. G. F. Matthew.‡

These are referred to *Cyathospongia* (?) *Eozoica*, and to *Halichondrites graphitiferus*. They are stated to occur in Upper Laurentian rocks.

The authenticity of these remains has been called in question by Mr. Herman Rauff.§

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* C. R. Ac. Sc. Janvier-Juin 1894, pp. 1433-1435.

† Société Géologique du Nord. Annales xxiii. 1895, pp. 52-64. pls. i.-ii. L. Cayeux.—De l'existence de nombreux débris de Spongiaires dans les phthanites du Pré-Cambrien de Bretagne. C.R. Ac. Sc. T cxx. pp. 279-282.

‡ On the Occurrence of Sponges in Laurentian rocks at St. John, N.B. Bull. Nat. Hist. Soc. New Brunswick, No 9, pp. 42-45.

§ H. Rauff. *Ueber angebliche Spongien aus dem Archaicum*, Neues Jahr. für Min., Geol. und Pal. II. Bd. 1893, pp. 57-67, and *Palæospongiologie*, Palæontographica, 1893, Bd. 40, p. 233.

3. Description of the Radiolari

Obviously the two most important points to be note are (*a*) that the supposed organisms are referal and (*b*) that the rocks which contain them are o Age.

If direct proof of the first is wanting, the que age of the rocks does not so much matter. We proceed first to quote evidence which, in our opir in favour of the structures about to be describe to the radiolaria, and afterwards we will deal wi of the geological horizon of the rocks which contai

Traces of the organisms referred by us prov radiolaria occur at two localities, (*a*) Brighton, S.S.W. from Adelaide; and (*b*) Crystal Brook, a N. of the same city. At (*a*) Brighton the for referred to the radiolaria occur scattered in throughout a greenish siliceous limestone. Th places exhibits well marked oolitic structure.

Thin sections of these rocks prepared by the Geological Laboratory, at the University of Sy these supposed casts of radiolaria are partly opaque, partly replaced by lime and transluce types are invested in places with a black netw

not spherulites nor oolitic granules, is rendered probable by the following facts :—

(1). In the Pre-Cambrian oolitic limestone of Hallett's Cove the nuclei of the grains are shaped irregularly, whereas the small translucent bodies inside the nebulous rings in the Brighton limestone are perfectly round or oval, and in some cases spinous.

(2). Distinct black netted material envelopes the spherical or oval bodies.

(3). The translucent material enclosed inside the rings does not show a dark cross, seen in polarised light, though, even if it did, this would not of course be an insuperable objection to its radiolarian origin. It proves, however, conclusively that they are not spherulites.

(4). They are probably not oolitic grains, not only on account of many of them possessing an external black network, but also because they are of exactly the same shape, size, and structure as similar bodies in the Pre-Cambrian cherts of Crystal Brook, and oolitic structure, as far as we know, has not been observed in cherts.

(5). Many of the casts very closely resemble those of Mullion Island, Cornwall, and those of the Jenolan Caves and of Bingera in New South Wales.

A considerable variety of forms appear to be present, most of which seem to belong to the Legion *Spumellaria.*

Figs. 5-6 of Pl. XXXIX. exhibit forms resembling *Carposphæra*, or possibly *Cenosphæra* with the internal cavity partly filled with chalcedony.

Fig. 7 of Pl. XXXIX. is suggestive of the genus *Cenellipsis.* It is possible, however, that the netted forms like those in the figures last referred to, are of inorganic origin, the pyrites filling in the interspaces between small crystalline aggregates partly of silica, partly of calcite.

The spherical chalcedonic bodies, surrounded by the outer chalcedonic rings, appear to us, however, to be very probably casts of the medullary and cortical shells of radiolaria. The diameters of these bodies vary from ·1 mm. up to ·22 mm.

(*b*) *Crystal Brook.*—In the black chert of Crystal Brook radiolarian casts are chiefly in the form of small spherica oval nuclei of chalcedony, with a more or less distinct part translucent outer ring of chalcedony. Much black opaque ma is present in this rock, as well as small spherical developmen iron pyrites, very suggestive of being inner casts of radiolari

The Crystal Brook forms, as to the radiolarian characte which we think there can be very little question, are show Figs. 1-3 of Pl. XXXIX. Their diameter varies from ·1 mm ·2 mm. Figs. 1-3 are very suggestive of forms allied to *Ce sphæra.*

4. Geological Horizon of the Radiolarian Rock.

As already stated, the two chief localities in South Aust where the supposed radiolarian casts have been met with are Brighton and (*b*) Crystal Brook. These localities merit sepa descriptions.

(*a*) Brighton.—The rocks from Brighton which have yi the casts above referred to were taken from the quarries o South Australian Portland Cement Company, situated at Bri about 10 miles S.S.W. from Adelaide, on a spur of th Lofty Ranges, which at this point describe a curve to the se

... the southern boundary of the Adelaide plains

... this company form outcro

... can b

ceding by a bedding plane. It is about 15 feet in thick- f a pale pinkish colour, and carries about 86 per cent. of ate of lime—the purest limestone in the group. The red faces of the vertical joints exhibit lines of false bedding.

lue siliceous Limestone.—This immediately underlies the loured limestone, and in the upper portions of the bed is ntly mottled by various sized pinkish patches. It contains er cent. or more of silica. The pink-coloured patches con- lower proportion of silica and correspondingly higher pro- of carbonate of lime, than the distinctly blue limestone.

ery siliceous dark-coloured Limestone of variable composi- ut carrying more silica than No. 3. This bed, as well as immediately above it, is strongly laminated. Whenever ature is present it is said to be an indication of a high tion of silica in the stone. This limestone is the lowest worked for cement, but the stone used by the company is won from beds Nos. 2 and 3. Immediately above this bed careo-siliceous shale of very close texture.

beds have a strike about N. 12° E. The dip varies from 50° to 80° in a direction about W. 12° N. These Brighton nay be considered the foothills of the Mt. Lofty Range, s and under which they appear to dip. Whatever, there- the age of the Mt. Lofty Range, the Brighton rocks will

Field River. A few miles further south the rocks forming the sea cliffs are contorted and overthrust from E. to W. in a very striking manner. If the coastline be followed to Normanville, 48 miles south from Adelaide, the crystalline and highly metamorphic beds of the eastern flanks of the ranges are met with. The marked lithological distinction between the western and eastern sides of the Mt. Lofty Ranges is an interesting feature. The greater part of the ranges, including the western flanks and highest portions of the watershed, show a series of sedimentary rocks metamorphosed to only a slight degree, with a general easterly dip at a steep angle of from 40° to 80°. The eastern flanks are composed of highly crystalline metamorphic rocks, felsites, hornblendic and micaceous schists, gneiss and granites, which give distinctive features to this side of the ranges for over 200 miles in length. Intrusive granites are extensively associated with this zone of extreme metamorphism.

Professor R. Tate * regards the Mt. Lofty Ranges throughout their entire width as forming one great conformable system, the aggregate thickness of which he estimates cannot be less than ten miles. Further, as the dip of these beds is in the main a south-easterly one, it follows upon the above assumption that the highly crystalline rocks of the eastern side of the watershed are actually superimposed on the less metamorphosed shales, limestones, and

Ir. R. Etheridge, Junr., to be of Cambrian age),* resting unconformably on an older series of mica slates and talcose schists, supplied new data bearing on the possible age of the Mt. Lofty formation. The basal or Pre-Cambrian beds at Ardrossan, exhibit a close lithological resemblance to many portions of the Mt. Lofty series, and may provisionally be considered to be homotaxial with the latter. Unfortunately, in no other place in South Australia, that we know of, are the Cambrian and Pre Cambrian rocks seen in juxtaposition, but they have been observed in the Flinders Ranges in close proximity to the Pre-Cambrian rocks, and it has been noticed that the two groups exhibit strongly marked lithological differences as well as probable unconformity (Pl. XL. fig. 2).

Prof. R Tate has for many years advocated the Pre-Cambrian (or Archæan) age of the Mt. Lofty formation.† The chief considerations for this view are based on—

(a) The evidence afforded by the unconformity between the Lower Cambrian and the Pre-Cambrian rocks near Ardrossan, and the general resemblance of the inferior rocks of that section to the Mt. Lofty beds (Pl. XL. fig. 1), (and so to the Brighton rocks).

(b) In the Flinders Range two formations have been noted (although not seen in contact) in which the less altered beds with lower angle of dip have been determined by their included fossils *Archæocyathinæ*, *Olenellus*, *Salterella*, &c.) to be Cambrian; and it has been inferred that the more highly metamorphic rocks with higher angle of dip are unconformable and consequently Pre-Cambrian. The Mt. Lofty beds are continuous with those of the Flinders Range.

(c) The absence of fossils (macroscopic) throughout the whole the Mt. Lofty series, even in places where limestones and shales occur so little metamorphosed that we have no reason to think that organic remains, if originally present, have been obliterated by molecular rearrangement.

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* Roy. Soc. S. Aust. 1890, p. 10, and R. Tate *ibidem* 1892, pp. 183-189.

† Roy. Soc. S. Aust. Vol. xiii. 1890, p. 20: Aust. Assoc. Ad. Sc. *Op. cit. ante.*

Mr. H. Y. L. Brown, Government Geologist of South Australia, holds, however, a somewhat different view from the above. Mr. Brown considers that the low degree of metamorphism present in the rocks of the western flanks of the Mt. Lofty range indicates an age not earlier than the Cambrian, and that the Flinders and Mt. Lofty beds really form one series. In his official Geological Map of South Australia, published in 1886, Mr. Brown recognises three older formations in the ranges, as follows :—

(1). PALÆOZOIC (LOWER SILURIAN).— Comprising the less altered shales, sandstones, and limestones of the western portions.

(2). PALÆOZOIC, or AZOIC.—The micaceous, talcose, and hornblendic schists, quartzites and crystalline limestones —a middle series towards the eastern side of the ranges.

(3). ARCHÆAN.—Metamorphic granite, gneiss, syenite, hornblendic and mica schists, crystalline limestones, quartzites, &c., with igneous intrusions, rising beneath group No. 2 on the eastern flanks.

It will be observed from this table that the succession is interpreted by Mr. Brown in an opposite way from that in which it is explained by Prof. Tate, for whilst the latter considers the highly metamorphic group the highest in the series, Mr. Brown places these strata at the base.

ts the siliceous limestones exposed in the vineyards ide, near Adelaide. Moreover, no macroscopic fossils ı observed by us in these limestones, in spite of their ffered extremely little through metamorphism, whereas Lower Cambrian limestones are abundantly fossili- ıd only slightly inclined, without distinct folding. At time, the fact must be mentioned that the Crystal Brook ın locality lies directly in the trend of the Cambrian n Yorke's Peninsula N. by E. towards the Blinman Mine .N.E of Port Augusta. On the whole, however, we ıt the evidence is in favour of the radiolarian rock at Brook being Pre-Cambrian.

. Summary and Provisional Deductions, &c.

Brighton and Crystal Brook in South Australia (their positions are shown on Pl. xl. fig. 3), rocks are which contain what appear to be casts of radiolaria. tter locality there can be little doubt, in our opinion, as ntity of the casts with those of radiolaria.

ıat the age of these rocks is Pre-Cambrian is rendered obable by the following considerations:—

e local Lower Cambrian rocks are gently inclined at from 8° to 15°, and they are not folded, whereas the n rocks dip at 45° to 80°, are considerably folded, and nderlie unconformably the Lower Cambrian formation.

Lower Cambrian rocks of South Australia are pure

these localities are very well adapted for preserving ma
fossils, had they ever existed in them.

(iii.) The evidence on the whole is decidedly in favo
existence of radiolaria in Pre-Cambrian rocks in South A

(iv.) Such radiolaria appear to differ very little in
the forms described from Palæozoic, Mesozoic, Tertiary
Tertiary rocks, as their diameters appear to range from
to ·22 mm.

(v.) Forms allied to *Carposphæra* and *Cenosphæra*, an
to *Cenellipsis*, appear to have been represented in Pre-
time.

We desire to express our thanks to Mr. Stanley F
manager of the South Australian Portland Cement Co
Brighton, who has kindly given all the help in his
facilitate our researches at Brighton. We have also
Mr. W. Lewis, of Brighton, for kind guidance and assist
Mr. J. W. Jones, the Conservator of Water, we are much
for the excellent arrangements which he made for our
examinations of Crystal Brook and Ardrossan. We al
to thank for much useful aid given us in the field the f
Mr Hicks, Mr. C. C. Buttfield and Mr. E. S. A. Wi
W. S. Dun, the Librarian and Assistant Palæontologi

–Internal cast from Crystal Brook, genus not determinable.

–Internal cast in siliceous limestone, perhaps referable to the Radiolaria; Brighton, near Adelaide.

and 6.—Internal casts in siliceous limestone, perhaps related to *Carposphæra*; from Brighton, near Adelaide.

-Form doubtfully referable to the Radiolaria, from siliceous limestone, Brighton, South Australia; possibly allied to *Cenellipsis*.

-Internal cast in siliceous limestone, perhaps referable to the Radiolaria; Brighton, South Australia.

PLATE XL.

-Sketch Section from near Ardrossan, Yorke's Peninsula, to Murray Bridge, South Australia.

–Section showing probable junction between the Lower Cambrian and the Pre-Cambrian Rocks near Ardrossan, Yorke's Peninsula, S.A.

–Map showing positions of chief localities where fossil Radiolaria have been found in S.E. Australia.

specific rank, and should not be merged in *C.*
Linn.

Mr. Brazier exhibited, for Mrs. Kenyon, a serie
of *Cypræa* mentioned in her Note, namely, an ad
Cypræa caput-anguis, Philippi, from Maldon Isla
fine variety *C. Sophiæ*, Braz., as well as of a large
solid specimen of *Cypræa tigris*, Linn., and a la
specimen of the same species showing the spots
transverse bands. Also a young specimen of *C.*
from Mrs. Waterhouse. Two specimens of a suppo
of *Pectunculus*, from an unknown locality, were al

Mr. Froggatt showed a large series of spirit sp
Termites treated of in his paper, together with sli
wings, &c.

Professor David exhibited, in illustration of hi
graphs, rock specimens, and, under the microscope
showing Radiolaria.

Mr. Ogilby exhibited specimens of two small Clup
that from an examination of a number of specime
vinced of the necessity for forming a third genus of "
Herrings." The three genera, will be described in
number of the Proceedings. Mr. Ogilby proposes
the Rough-backed Herrings, recent and fossil, und
name *Hyperlophinæ*, and points out that the nan

had seen for the first time specimens of the Boronia n. These were obtained by Miss King from the ry during last month, and forwarded to Melbourne. s was described by Sprengel in 1827, from specimens y Sieber in 1823, somewhere in the neighbourhood of on the Blue Mountains. By Mr. Bentham it was con- be a dimorphic form of *B. pinnata*, but by Prof. Urban t has been restored to independent specific rank. As with *B pinnata* its chief distinguishing characters are of the eight stamens are shorter and have smaller e style is short, and the stigma large and globular. was also expressed by the Baron that as the characters it are yet unrecorded, an effort might be made during t season to obtain them for comparison with those of *B.*

tcher exhibited a series of water-colour drawings of animals, of great intrinsic merit as well as of historical They were the artistic work of Dr. J. Stuart, an army ho from time to time for some years (circa 1834-37 or) undertook the duties of Medical Officer at the Station, Port Jackson. They are referred to in one ers (Ann. Mag. Nat. Hist. viii. 1842, p. 242) by the 7. S. Macleay, into whose possession they subsequently Eventually they came to Sir William Macleay, who m over to the Society.

WEDNESDAY, NOVEMBER 25TH, 1896.

The Ordinary Monthly Meeting of the Society was held at the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, November 25th, 1896.

The President, Mr. Henry Deane, M.A., F.L.S., in the Chair.

DONATIONS.

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[redacted]

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ON THE COMPARATIVE ANATOMY OF THE ORGAN OF JACOBSON IN MARSUPIALS.

By R. Broom, M.D., B.Sc.

(Plates xli.-xlviii.)

Although the researches of Gratiolet, Balogh, Klein, and others had made us familiar with the structure and relations of Jacobson's organ in a number of the principal types of higher Mammals, until very recent years no examination appears to have been made of the organ in any of the Marsupials.

In 1891, Symington published a paper "On the Organ of Jacobson in the Kangaroo and Rock Wallaby," in which he points out the main features of the organ and its relations, and gives figures of transverse sections at the opening of the organ and also at its most developed part. He concludes that the Marsupial organ agrees very closely with the Eutherian type, and differs markedly from that found in the Prototherian Ornithorhynchus. It is unfortunate that when his paper was written only the aberrant Platypus type had been carefully studied, for had he compared the Marsupial organ with the simpler Monotreme type as found in Echidna, his conclusion would probably have been different.

In 1893, Röse, apparently ignorant of Symington's work, published a very short paper on the organ in the Wombat and Opossum. He gives two good figures of the organ in the young Wombat, but makes no remarks on the peculiarities of the organ or its relations.

The only other papers, as far as I am aware, in which the Marsupial arrangement is touched on are, Symington's recent paper "On the Homology of the Dumb-bell-shaped Bone in

Ornithorhynchus," and some papers of my own where various references are made to points in the Marsupial anatomy for purposes of comparison.

In the present paper I shall confine myself mainly to the consideration of the general morphology of the organ and its duct, with their cartilaginous and bony relationships, and their vascular and glandular connections in typical members of the chief groups of Marsupials, and to the morphological significance of the various peculiarities met with. In discussing the various forms, I shall adopt tentatively the classification as given in Thomas' "British Museum Catalogue of Marsupials and Monotremes"; and as the polyprotodont Marsupials have long been recognized as the more generalised—a view which is confirmed by the study of the region under consideration—it will be convenient to examine these first.

DASYURIDÆ. (Plate XLI.)

Of this group I have studied, (1) Early mammary fœtal *Phascologale penicillata*, (2) mammary fœtal *Dasyurus viverrinus*, (3) two-thirds grown *D. viverrinus*, and (4) adult *D. maculatus*.

If a series of transverse sections be made of the anterior part of the snout of Echidna, it will be found that there passes out from each side of the base of the septum a flat cartilage, forming a floor to each nasal cavity. In the very young animal, as shown by

ıssing outwards from the base of the septum and complete floor to the nasal cavity, uniting laterally inasal. On nearing the naso-palatine canal, its inner es detached from the septum and curves upwards and wards (Pl. XLI. fig. 10). The naso-palatine canal passes obliquely backwards, as well as upwards, so that in :tion it is seen connecting the nasal cavity with the 'n its passing upwards the premaxillary is seen to ›m its palatine process as if to make a passage (fig. 10), e behind this the nasal-floor cartilage divides into its ›uter parts. The outer part, which is small, disappears nediately behind this plane; but the inner part, or cartilage, is well developed and appears as an upright a large process passing outwards from its upper end g a support to the *inferior septal ridge.** The lower ported on its lower and inner side by the developing ocess of the premaxillary.

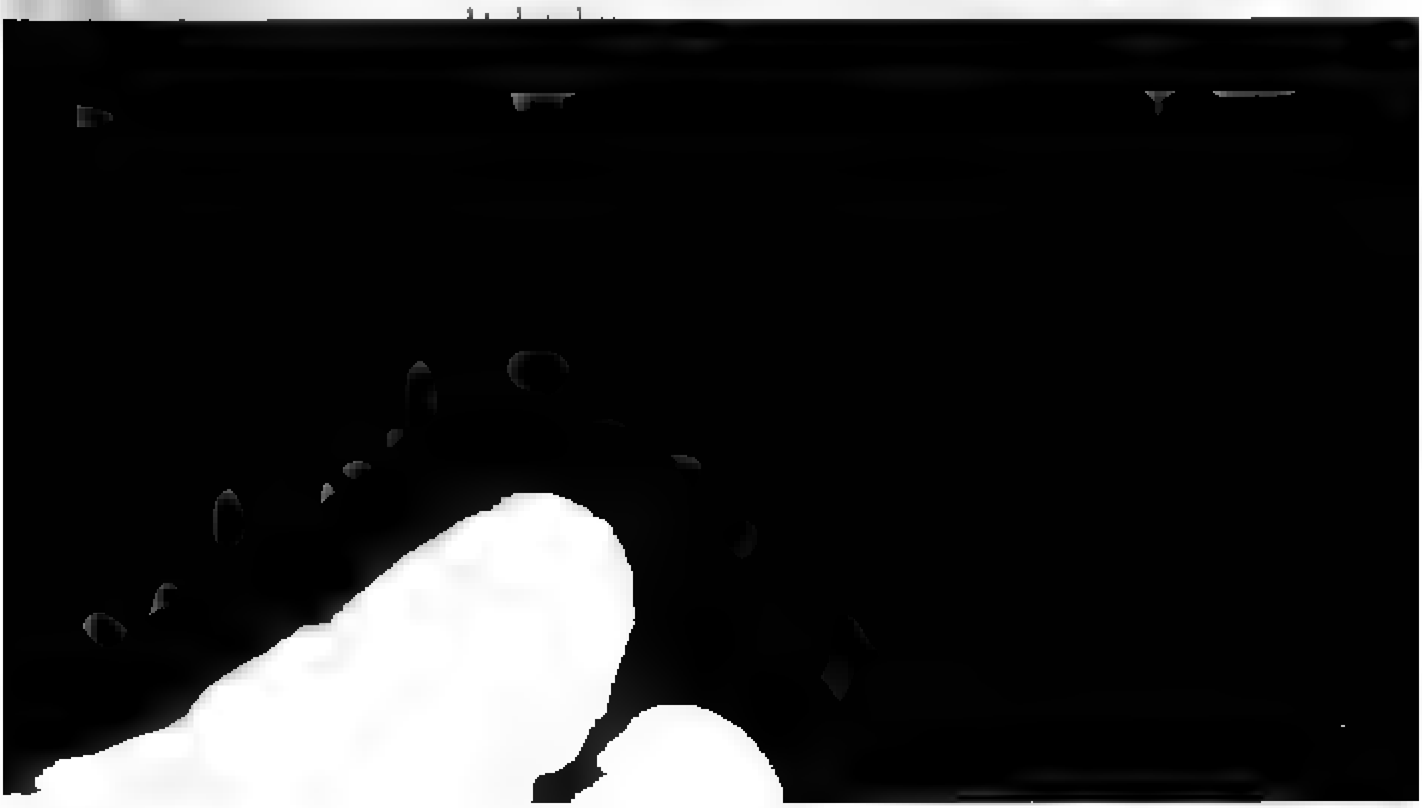
l the naso-palatine canal has lost its connection with and above is seen to receive the opening of Jacobson's : inner side, and on its outer side to be connected with :avity. Jacobson's cartilage is here well developed, acobson's duct or organ in its concave outer side. If ı be compared with the similar section in the young

Echidna as figured by N. Parker, or in the adult as fig
myself, the striking agreement will be manifest.

In fig 12 is seen the condition of the organ and its
in the region of its greatest development. The organ i
oval in section, there being but a very slight indentatio
outer wall, the inner and lower walls of the organ are a
times the thickness of the outer. Jacobson's cartilage is
plate which supports the organ on its inner and lower sid
palatine process of the premaxilla, here just commencing
occupies the lower and inner side of Jacobson's cartilage.

Near its posterior part the organ is reduced to a c
simple columnar epithelium, and the cartilage is pres
narrow thick plate passing more outwards than downwa
forming a floor to the duct and its neighbouring developin

Dasyurus viverrinus, Shaw, (mammary fœtus, hea
15 mm.). In the somewhat older fœtus of the common
we have the same type, but with the later stage of dev
the details are better seen. The nasal-floor cartilage
similar to that seen in the fœtal Phascologale, but an a
feature is revealed. From the point where the ascend
plate of the nasal floor cartilage sends out the plate to sup
basal ridge a detached process of cartilage passes forw
porting the feeble anterior part of the ridge. This is be
in the adult, and is interesting from the fact that a sin
current process has not been found in any other forr



short duct lined with squamous epithelium. On the left side, which is further back, the opening of the organ into the naso-palatine canal is closing, while the connection between the canal and the nasal cavity is seen. Immediately beyond this plane Jacobson's organ is closed and the lower part of the inner plate of Jacobson's cartilage becomes connected with the outer bar, forming a floor to the organ; and what was the naso-palatine canal becomes lost in the general nasal cavity.

Fig. 4 represents a section through the body of the organ. The cartilage on section assumes the appearance of an irregular L or a U with the outer side shorter than the other—an appearance very common in Marsupial types. It is supported on its lower and inner sides by the scroll-like palatine-process of the pre-maxilla. The organ on section is kidney-shaped, with a much indented hilus, which accommodates the rather large blood vessel.

Dasyurus viverrinus, Shaw, (two-thirds grown). In the grown Dasyure the condition of parts is essentially similar to that in the 'oung. Fig. 5 shows a section in the region of the hinder part f the papilla—a portion of the papillary cartilage being seen. he nasal-floor cartilage is moderately flat, and somewhat above s inner end by the side of the septum is seen the small precurrent rocess of cartilage supporting the septal ridge. In fig. 6 the pre-iaxillary is about to give off its palatine process. The naso-alatine canal is seen cut across below the isthmus, while above ; the nasal-floor cartilage is dipping down into the hollow. The uter part of the nasal-floor cartilage behind this becomes lost in). *viverrinus*, though in *D. maculatus* it is seen for a short time s a very small fragment on the outer side of the naso-palatine anal. The organ opens into the naso-palatine canal almost nmediately behind the plane of fig. 7. Fig. 8 is just behind the ening of the organ and immediately in front of the plane where ie naso-palatine becomes part of the general nasal cavity. Here ie organ is roofed over by the union of the inner plate of Jacob-n's cartilage with the outer bar. In fig. 9, a little further back, ie upper union with the outer bar is lost and the lower connec-

quite upwards and having in it a single large blood
is extremely little glandular tissue in connection wi
and middle part of the organ. The sensory layer is
developed, being about 3½ times as thick as the n
layer. The outer wall of the organ has small colur
about half the size of those of the nasal epithelium.

Dasyurus maculatus, Kerr, (adult). The organ
differs considerably in a number of ways fror
viverrinus. In almost all large animals the organ is
proportionately, and appears to have less of a sei
and to become to a greater extent a glandular duct
the difference in the character of the organ the
relations remain very constant in allied species and
only difference in the cartilaginous development
species of Dasyurus is a very slight one of degr
maculatus the cartilage is rather more developed
rather less posteriorly than in the smaller species
the organs, however, the differences are marked.
layer is present quite characteristically, but much
than in *D. viverrinus*, while the whole organ
smaller in lumen, which means that it is relative
half the size. Instead of occupying almost the
cartilaginous hollow as in the smaller species, it fi
one-third the available space, the rest being almost
by a great development of mucous gland tissue
occupied by the large hilar vessel.

Flower in supplying me with three mammary fœtuses—one small and two moderate-sized—of which I have sectioned the small one and one of the large.

Didelphys murina, L., (mammary fœtus, head length 14 mm.). In the young fœtal Opossum the anterior portion of the nasal-floor cartilage agrees very closely with the condition in the Dasyure; not only is it comparatively flat, but from its ascending inner plate it gives off a precurrent process to support the anterior part of the septal ridge. In the plane of the papilla (fig. 1) the premaxilla is seen giving off its palatine process. The nasal-floor cartilage is here curved, the inner end passing up by the side of the septal base into the septal ridge, while it is slightly depressed into the hollow between the premaxilla and its palatine process. A broad but not very thoroughly chondrified papillary cartilage is seen in the section; and by its edge the naso-palatine canal is seen opening. In fig. 2—a little distance behind—the nasal-floor cartilage is found to have become divided as in Dasyurus, the inner part having become a well developed Jacobson's cartilage, while the outer part has on this plane become lost. If this figure be compared with fig. 2 of the Dasyure the close agreement between the forms will be seen in the structure of Jacobson's cartilage. There is, however, a slight difference in the relations borne by the developing palatine processes to the cartilages. In Dasyurus the palatine process is mostly inferior; while in this form it lies within the lower half, the bottom end of the cartilage being unsupported by bone. This though apparently a small matter will be seen to be of considerable interest in connection with the condition in the other forms to be described. In *Didelphys murina* the septal ridge is more marked, the lower corner of the nasal cavity passing well in below it. The naso-palatine canal will be noticed to have an almost vertical direction, the obliquity being very slightly marked. The connections of the canal with Jacobson's organ and with the nasal cavity are as in Dasyurus, except that in *Didelphys murina* the organ becomes constricted into a little roundish duct-like canal before opening into the naso-palatine canal. This little constricted part is not a

true Jacobson's duct, as it is lined with columnar epithelium. The organ where best developed, as seen in fig. 3, almost completely fills the large hollow cartilage. On section it is kidney shaped, but the two poles are approximated so as to give the organ an almost circular appearance, folding the small outer wall closely on itself. The cartilage is supported by the small curved palatine process at its lower and inner side.

Didelphys marsupialis, L., (?)* (large mammary fœtus, head length 37 mm.). Between this form and the fœtal *D. murina* there are a number of little differences, in addition to what can be accounted for by difference of age. The nasal-floor cartilage is nearly flat, and on passing backwards turns up at the base of the septum as in *D. murina*. The inferior septal ridge is here less developed, and the precurrent cartilaginous process, present in *D. murina*, is practically absent. In fig. 4 is shown a section in the plane of the opening of the naso-palatine canal. Though the papilla is well developed there is no trace of a papillary cartilage, which is interesting as this is the only Marsupial I have met with where it is quite absent. In fig. 5 the nasal-floor cartilage is found divided and the premaxilla distinct from its palatine process; and in the space between the divided structures is seen the anterior part of the almost vertical naso-palatine canal. The outer part of the nasal-floor cartilage is still distinct. A few

[redacted]

The organ itself in the region of best development (fig. 9) has on section the usual kidney shape. There is some resemblance to the organ in Dasyurus, with which it agrees in having a single vessel along the hilus; in Didelphys, however, the blood vessel is considerably smaller. The sensory region is well developed, the upper and lower ends of which curve towards each other constricting the hilar region slightly. In the hilar region are a few mucous glands which open into the organ at the point of union of the upper end of the sensory wall with the non-sensory. The main nerves lie as usual in the little triangular space above the organ.

PERAMELIDÆ. (Plate XLIII.)

In the Bandicoots I have confined myself to the study of one species, *Perameles nasuta;* of which I have examined—(1) a young mammary fœtus; (2) a half grown specimen; and (3) an adult. To Mr. A. G. Hamilton, of Mt. Kembla, N.S.W., I am indebted for the fœtus and the adult specimen.

Perameles nasuta, E. Geoff., (mammary fœtus, head length 1 mm.). In a section through the developing first upper incisor, and also a little in front of and behind this plane, the nasal-floor cartilage will be found to be well developed and moderately flat. By each side of the base of the septum is a rather large inferior septal ridge, and into the base of it, at least, passes an ascending plate of the nasal-floor cartilage, lying close to the septum. This ascending plate is better developed anteriorly in this genus than in either Dasyurus or Didelphys. On reaching the papillary planes the septum is found to have retreated, and its place to have become occupied between the two ascending plates of the nasal-floor cartilage by the two palatine processes of the premaxillary (fig. 1). This very marked retreating of the base of the septum is greater than in the other Marsupials, and recalls the condition in the Insectivora. In fig. 1 is shown the moderately developed papillary cartilage, by the edge of which the naso-palatine canal is seen entering. Here also the well developed nasal-floor cartilage is seen passing up and curving round into the septal ridge forming

its support. In the immediately succeeding planes the inner plate of the nasal-floor cartilages about to become Jacobson's cartilages are seen approaching somewhat and the palatine processes becoming more curved along their inner sides; while the process of cartilage supporting the ridge becomes a detached bar. This bar thus becomes detached further forward than in either Dasyurus or Didelphys. A very short distance behind the plane of the posterior part of the papilla, the naso-palatine canal is found passing inwards below the lower edge of Jacobson's cartilage and even below the lower edge of the palatine process. From this point it passes outwards, upwards, and slightly forwards into the hollow of the lower half of Jacobson's cartilage, where it meets a short but distinct Jacobson's duct. It also passes outwards and backwards, as seen in fig. 2, opening into the nasal cavity. On this plane the short duct of Jacobson is replaced by the lower part of the organ proper, which is almost shut off from the naso-palatine canal. In the relations of the canal to the lower part of the palatine process and of the cartilage of Jacobson there is a marked agreement with Didelphys, though the lower unsupported part of Jacobson's cartilage is much greater here than in that genus, and clearly suggest the development met with in both the Phalangers and the Kangaroos. Almost immediately beyond the plane of the closing of the organ the lower end of the inner plate

ess, and ultimately all that is left of it is a small plate lying the upper and inner side of the reduced posterior end of the l.

'ameles nasuta, E. Geoff., (half grown and adult). Between lult and half grown condition the chief differences are due fact that in the adult the bony development is greater and rtilaginous elements more degenerate. In the following it it is the half grown specimen that is being described otherwise stated.

he region immediately in front of the incisor teeth, the eptum is rather broad and at its base has on each side a veloped inferior septal ridge. The nasal-floor cartilage is ely feeble on the whole, but its inner part is better ped and turns up close against the septum, then curves ds to form the support of the septal ridge. On reaching ne of the first pair of incisors, the only difference worth is that the septum has retreated somewhat, and only the part of the nasal-floor cartilage remains.

he adult, even in the region of the predental portion of maxillary, the nasal-floor cartilage is represented by little han the inner part.

he plane of 2nd incisor in the half grown specimen the loor cartilage is represented only by the skeleton of the while on the same plane the premaxilla is seen sending up ess towards the base of the septum. In the anterior ry region, as seen in fig. 5, the cartilage is found present inner plate and an outer bar. Though this is in front of so-palatine canal, as there is no outer part of the nasal-floor ge, it will be better to call it Jacobson's cartilage, for there is no organ at this point, from the condition of the ges and other structures it is highly probable that the once extended forwards considerably in advance of its g into the naso-palatine canal, as is the case in Ornitho- ius. As it is, the organ still extends some little way in front opening into the naso-palatine canal, and on one side of the anterior extension is seen cut across.

In fig. 6 and fig. 7 the very short naso-palatine canal is seen first opening into Jacobson's organ and then connecting the nasal cavity with the mouth in the usual manner. In both figures the enormous development of the palatine processes is the most noticeable feature. On the outer side of the outer bar of Jacobson's cartilage is seen in section a precurrent process from the outer part of the palatine process of the premaxillary. On the left side of fig. 7 the inner plate of Jacobson's cartilage is seen sending down a process by the side of the canal; on the right side, which is a little further back, the inner plate of Jacobson's cartilage has united with the outer bar.

In the adult in the region just considered the palatine process of the premaxillary is very similar, but the cartilage has degenerated into a few irregular patches. It is interesting that the downward process of Jacobson's cartilage by the side of the naso-palatine canal is persistent (fig. 9).

In the region of greatest development the organ is very similar to that in the other Polyprotodonts. In the adult the cartilaginous capsule is scarcely observable, the organ being almost entirely supported by the well developed palatine process. The sensory wall is fairly well developed, though less so than in either *Dasyurus viverrinus* or Didelphys. Along the hilus there runs a single moderate-sized vessel, and a rather large vein runs along

'tauroides volans; (4) adult *Petaurus breviceps;* (5) very early ammary fœtus, *Trichosurus vulpecula;* (6) early mammary fœtus, ichosurus; (7) large mammary fœtus, Trichosurus; and (8) ult Trichosurus.

In all these genera the same type is followed, and the close eement between the different genera is remarkable.

'seudochirus peregrinus, Bodd., (mammary fœtus, head length mm.). In the anterior papillary plane and a little in front the l-floor cartilage is well developed, but not of very great lateral nt. The nasal septum comes well down and anteriorly the l-floor cartilage abuts squarely against it; but in the middle n of the papilla the septum has begun to retreat, and the r end of the nasal-floor cartilage curves up towards it some-. There is on each side a well developed septal ridge, and iasal-floor cartilage sends a feebly developed process towards In Pl. XLIV. fig. 1, the ridge process is not so well developed as in front. In this section will be seen a feature which is loped in all the Diprotodonts as distinguished from the Poly-odonts, in the great lateral development of all the structures. inferior septal ridges project more, making the base of the al region much broader; the nasal-floor cartilages are further t at their inner ends, and the palatine processes which are loped in connection with Jacobson's cartilages are, in their y development instead of closely together as in the Polypro-nts, widely apart. The naso-palatine canal passes obliquely ards and backwards, and opens into Jacobson's organ on tically the same plane as that in which it becomes part of the ral nasal cavity. In Pl. XLIV. figs. 2 and 3, the nasal-floor is d divided. Jacobson's cartilage is hollowed slightly on the r side, and in the hollow lies the palatine process of premaxilla. In the region of best development Jacobson's lage is present as a slightly concave plate, which nes markedly outwards as well as downwards from base of the septum. The palatine process is present as all ossified bar lying along the middle of the inner side. The n itself is almost oval on section; the inner wall of which is

more than half the diameter, while the lumen is slightly crescen-tic, owing to the outer wall being much better developed at its central than lateral portions.

Pseudochirus peregrinus, Bodd., (adult), *Petauroides volans* Kerr, (adult), and *Petaurus breviceps*, Waterh., (adult). These three genera agree with each other so markedly that it will only be necessary to describe the condition in one—Petaurus—and call attention to the points in which the others differ from it.

In a plane immediately in front of the papilla, the condition of the nasal-floor cartilage is found to agree very closely with that described in Perameles, each inner end having an ascending plate closely placed against the sides of the base of the septum. The only marked difference is that the lateral part of the cartilage is much curved; this, however, is rendered necessary by the largely developed first incisors. In the plane passing through the middle of the papilla the inner ascending plate of the nasal-floor cartilage is much shorter, but has become broadened out, while the inferior septal ridge, which anteriorly was developed considerably verti-cally, is here a much more defined ridge, and from the outer angle of the irregular square shaped inner part of the nasal-floor cartilage a slight process passes into the ridge. The outer part of the nasal-floor cartilage becomes almost entirely lost. Pl XLIV fig. 10 represents a section through the third incisor or the posterior

he lower edge of the palatine process, a condition more nt in Pseudochirus than in Petaurus. On passing back- the outer part of the cartilaginous process of the ridge s detached as the outer bar of Jacobson's cartilage. In r. fig. 11 the anterior part of Jacobson's organ is indicated, e naso-palatine canal connected with the short duct of the

In Pl. XLIV. fig. 12 the organ communicates freely with the ıvity at the plane where the naso-palatine canal becomes the cavity.

ı Pl. XLIV. figs. 5 and 6 it will be seen that in Pseudochirus ning of the organ is more directly into the upper part of ıal, while in Petauroides (fig. 8) the condition agrees early with that in Petaurus. The difference, however, a very slight one of degree.

· the closing of the organ the lower part of Jacobson's e unites with the outer bar in the usual manner. In chirus the ridge is considerably lower than in the other gers, so that when the lower part of Jacobson's cartilage lete, instead of an irregular U-shaped appearance we have regular L, as in Pl. XLIV. fig. 7. In Petauroides (fig. 9) tilage has the more usual appearance.

organ in all these genera is well developed, and has on a rather elongated kidney shape. In the small Petaurus ısory wall is larger proportionally than in the other two

The hilus is very broad and only but slightly depressed, a larger lumen to the organ. In all three genera there is ıct venous plexus usually composed of one, two, or three anteriorly, which branch into six or more posteriorly. re but few glands in connection with the organ, except at terior part.

osurus vulpecula, Kerr, (mammary fœtus, head length .). In this very small mammary fœtus, which may be as the size at birth, the cartilages are all fairly well ed, and the ossification of the premaxillary bones quite ly marked. In the plane of the developing incisors the or cartilage is very well developed, as seen in Pl. XLV. fig. 1.

parts; before dividing, however, the downward p
inner part makes itself manifest. On the left side of
representing the plane a little behind the division
floor cartilage, Jacobson's cartilage is seen as a curve
near the middle of the inner concave side, the develo
process, present as a minute spicula of bone. Th
process, it will be seen, is more marked than in the y
chirus. The naso-palatine canal has the usual relat
first into Jacobson's organ and then becoming m
nasal cavity. The organ is present as a small oval t
inner wall considerably thicker than the outer.

Trichosurus vulpecula, Kerr, (mammary fœtus,
10·5 mm.). In this more developed mammary fœtus
of parts are better seen. In Pl. XLV. fig. 4 is shown
structure of the inner part of the nasal-floor cartilag
division. From this figure it will be seen that th
process is a structure superadded to the simple nasal-f
as seen in the Dasyure. The same can probably al
the internal ascending process. In Pl. XLV. fig.
cartilage is an almost vertical plate with the rod
process along the middle of the inner side. The c
very large.

Trichosurus vulpecula, Kerr, (mammary fœtus,
20 mm.). In the series of sections from this speci
the steps intermediate between the condition in th
and the adult. The nasal floor cartilage before divis

The ridge process, on the other hand, so large in the Ringtail and Flying Phalangers is only slightly developed in Trichosurus. The descending process is very distinct; and the palatine process more developed vertically than in the younger fœtuses. In Pl. XLV. fig. 8 the naso-palatine canal passes up almost vertically and opens into Jacobson's organ. At this stage there is no chondrification of the outer bar. In the following figure the organ is closed; and the naso-palatine canal is merged in the nasal cavity. Even in this plane the outer part of the nasal-floor cartilage is still well developed. Jacobson's cartilage is an almost vertical plate, and the organ lies against it much flattened from side to side.

Trichosurus vulpecula, Kerr, (adult). In the adult common Phalanger there is considerable agreement with the condition in the adult Petaurus. All the main peculiarities are due to two facts—(1) a much less degree of development of the inferior septal ridge in Trichosurus; and (2) a greater development of the outer nasal-floor cartilage.

In Pl. XLVI. fig. 1 through the posterior papillary region, the inner part of the nasal-floor cartilage is very similar to that in Petaurus, except that the ridge process is more feeble here; the outer part of the nasal-floor cartilage though small is, however, better developed than in Petaurus. The papillary cartilage is well seen in this plane and is interesting from its having a distinct median ridge. In Pl. XLVI. figs. 2, 3 and 4, is seen the mode of division of the nasal-floor cartilage, which is more complicated than in any of the other common Marsupials. In the most anterior part of the gap between the premaxilla and its palatine process there is a most distinct, rather large, descending process filling up the whole gap. On the naso-palatine canal passing up, and on the premaxillary being farther removed from the palatine process, the descending cartilaginous process remains only as a narrow internal plate lying close against the palatine process (Pl. XLVI. fig. 2). In this plane the ridge process though small is distinct, and is connected with both the inner plate of Jacobson's cartilage and the outer part of the nasal-floor cartilage. In Pl. XLVI. fig. 3, a very little behind the previous plane, an anterior prolongation of

becomes detached from the inner plate, it still reta
tion with the outer part of the nasal-floor cartilage.
fig. 4, however,—a little further back still—the ou
from the nasal-floor cartilage which is now lost.
the appearance quite agrees with that in the Ringt
connecting with the naso-palatine canal in quite
In Pl. XLVI. fig. 5 the organ is closed, and the naso
is merged in the nasal cavity. In the following fi
appearances are presented. The inner plate of Jacol
has united below with the outer bar, and an irreg
hollow is formed for the reception of the organ.

The organ is large and has an irregular crescenti
a well developed sensory wall. The hilus is large
two or three large veins and one or two small; whil
outer side of the organ is an enormous amount
tissue, in which it differs from that of the other Ph

Subfamily PHASCOLARCTINÆ. (Plate XLV

Phascolarctus cinereus, Goldf., (two-thirds grown)
arctus we have a very highly modified type wl
many ways from that of the Phalangers just descri

The naso-palatine canal is very long and oblique.
fig. 7 we have represented a section through the pl
front of the point where the premaxillary gives o
process. In this and the following sections the
peculiarity is the depth of the secondary palate.

In the lower part of the section the naso-palatine canal is seen cut across.

On reaching the plane where the premaxillary gives off its palatine process the nasal-floor cartilage is found to bend down into the gap formed, as seen on the left side of Pl. XLVI. fig. 8. There is no more than a slight indication of a downward process apart from the general dipping down and thickening of the nasal-floor cartilage. The palatine process is by the side of the lower third of the downward bent cartilage; while the naso-palatine canal is seen almost in contact with the lower part of the cartilage. On the right side of the same figure is seen the condition a little farther back. The large solid downward extension has given way before the ascending naso-palatine canal, and there is formed a well marked inner plate, extending from the side of the base of the septum, down past the vomer and along the upper half of the palatine process. From the upper end of this plate there passes an outward and downward process which becomes continuous with the outer part of the nasal-floor cartilage. In Pl. XLVI. fig. 9 we see the inner part of the nasal-floor cartilage or Jacobson's cartilage separated from the outer. It has a well developed inner concave plate, with above a downward and outward sloping roof. In the hollow is the anterior part of Jacobson's organ connected with the naso-palatine canal near the point where it merges into the nasal cavity.

Beyond this plane there is found passing up from the lower edge of the inner plate a process meeting the lower edge of the roof and forming a complete cartilaginous tube for the organ.

The organ itself, however, is very feebly developed relatively, though it possesses the usual sensory wall. There are very few glands in the tube; but it is extremely interesting to find a plexus of five or six large veins on the outer side of the organ. The whole length of the organ is somewhat less than 10 mm.

MACROPODIDÆ. (Plate XLVII.)

Of the Kangaroo group, Symington, as already stated, has examined the small mammary fœtus of *Macropus giganteus* and

of *Petrogale penicillata*, and found that the condition in bo forms is "practically identical." Of this group I have examin (1) a series of sections prepared by Prof. Wilson, of a very sm mammary fœtus of *Macropus sp.?*; (2) a large mammary fœtus *M. ualabatus;* and (3) a small mammary fœtus of *Æpyprymnu rufescens.*

Sub-family MACROPODINÆ. Plate (XLVII. figs. 1-9.)

Macropus sp.? (mammary fœtus, total length 29 mm.). In this very young fœtus the condition of parts agrees very closely with that in Trichosurus. The nasal-floor cartilage is well developed in the anterior part (Pl. XLVII. fig. 1), but before reaching the upper opening of the naso-palatine canal the outer part is lost. There is a distinct though small downward process. The naso-palatine canal passes up almost vertically, and the organ of Jacobson opens into it on the same plane as that in which it unites with the nasal cavity (fig. 2). The palatine process is represented as in Trichosurus by an ossifying rod near the middle of the inner plate of Jacobson's cartilage. Posteriorly the condition agrees with that in the early fœtal Trichosurus.

Macropus ualabatus, Less. & Garn., (large mammary fœtus head 50 mm.). This specimen may be taken as the type of the Kangaroo.

the nasal-floor cartilage is hollowed out to accommodate an anterior projection of Jacobson's organ, but we are thereby enabled to understand the different parts. If this section be compared with Pl XLV. fig. 3, the Trichosure condition, there is no trouble in making out the homology of the different parts. The inner plate corresponds to that in Trichosurus, except that it does not curve downwards at its lower end, but retains its connection with the outer part of the nasal-floor cartilage. On the outer side of the opening in the cartilage above the organ is seen a distinct knob attached to the outer nasal-floor cartilage; this is unquestionably the outer bar of Jacobson's cartilage, agreeing closely with the condition in Trichosurus; while the upper opening in the cartilage is due to the customary detachment of the outer bar from the inner plate of Jacobson's cartilage. In Pl. XLVI.. fig. 4 we have the more usual condition revealed; almost the only difference, in fact, from the similar section in Trichosurus (Pl. XLV. fig. 4) is due to the absence or reduction of the inferior septal ridge in Macropus. The naso-palatine canal opens into the organ and the nasal cavity in the usual way.

At its hinder end, as seen in Pl. XLVII. fig. 9, the organ is situated well up the side of the septum, a condition recalling the appearance in the human fœtus.

The organ itself is on the whole rather feebly developed, and has the appearance of a degenerate Phalanger type. There are few glands anteriorly, and in the hilus are only a few small blood vessels.

Sub family POTOROINÆ. (Plate XLVII. figs. 10-12.)

Æpyprymnus rufescens, Gray, (mammary fœtus, head length 15·5 mm.). In the Rat-Kangaroo, though we have a fairly close agreement with the condition in Macropus, we have some remarkable differences. Pl. XLVII. fig. 10 represents a section in the plane of the 2nd upper incisors. The nasal-floor cartilage is well developed, and at its inner part is found turning round to support the inferior septal ridge more after the manner of the Polyprotodonts than of the Phalangers. In the plane through the point

where the palatine process is first seen distinct from the premaxilla, the inner part of the nasal-floor cartilage curves markedly upwards and sends out a well marked though feeble plate into the inferior septal ridge. At the lower angle of the nasal-floor cartilage there is sent down a short process into the gap between the premaxilla and its palatine process.

Immediately following this plane we have the remarkable condition shown in Pl. XLVII. fig. 11. The outer part of the nasal-floor cartilage is detached from Jacobson's cartilage, which is present as an inner plate and an outer bar. In the hollow is found the anterior portion of Jacobson's organ opening directly into the anterior part of the nasal floor, and in no way directly connected with the naso-palatine canal. It is only some sections posterior to this, after the organ is quite closed, that the naso-palatine canal unites with the nasal cavity. In other respects the ordinary arrangement is followed.

The relation of the palatine process to the cartilage is more like that found in Petaurus than in Macropus.

In the early fœtal specimen the vascular and glandular relation of the organ cannot be made out very satisfactorily, but there is apparently nothing remarkable about the organ itself.

PHASCOLOMYIDÆ. (Plate XLVIII).

...n, shows some of the Diprotodont characters, *e.g.*, the carti-s being considerably apart, and the organ having a large gland entering it from above.

...hascolomys mitchelli, Owen, (half grown specimen). In this ...men, which may be taken as the adult type, we have a great ...arity in many ways to the condition in Phascolarctus. Here ... is, however, but a very feeble development of the outer -floor cartilage, and in this resembling Macropus.

Pl. XLVIII. fig. 3 we have a section through the posterior part ...e very large papilla—a portion of the papillary cartilage ... still seen. At this plane the septum dips considerably ... the level of the nasal floor, and has by the side of the deep ...n a descending plate from the nasal-floor cartilage, or ...ly rather an enormously thickened inner end of the cartilage. ... 4 this large inner part of the nasal-floor cartilage becomes ...nore developed and extends down into the hollow formed ...een the premaxillary and its palatine process, about to become ...hed in section. Below the bony isthmus is seen the very ... and oblique naso-palatine canal. In fig. 5 the palatine ...ss is detached from the premaxilla, and in the gap between ...istinct descending plate which almost meets the naso-palatine ... and rests on the palatine process. The cartilage is excavated ...e middle for the anterior part of the organ, but its roof is ...e and united with the feeble outer portion of the naso-...ine canal. Fig. 6 shows the anterior part of the organ ...ted in the hollow of Jacobson's cartilage and opening into ...aso-palatine canal exactly as in Macropus. Here the outer ... of the roof cartilage has become detached from the outer ...l-floor cartilage. A little behind this plane the lower part ...acobson's cartilage passes up and forms a complete tube for ...organ as in Phascolarctus. The palatine process is situated ... much as in Macropus, but more inferiorly.

...he organ is fairly developed, and more than half fills the ...ilaginous tube. At its upper inner angle it receives a number ...gland ducts, the glands lying at the inner side of the upper

From the examination of Jacobson's organ in th
of Marsupials, it will be noticed that although t
variations of details, the same general plan is f
though the habits of the different animals vary gr
the habits are very distinct differences of tooth str
some of the animals are nocturnal and others love
some gregarious and others solitary; all posse
developed organs of Jacobson, and in all have we
type of structure followed. Studies in Eutherian
the same conclusions, viz., that the type of organ
with the habits, but remains constant throughout
apparently not very nearly related animals. Fo
have one type in such dissimilar forms as the Ox
Dog, Cat, and Hedgehog, but quite a differen
Rodents. From this constancy of type followed
is manifest that it must be a very valuable factor
cation of groups—apparently of more importance
dentition.

Before considering the morphological importance
varieties in the Marsupialia, a few general obser
well. In Mammals generally it would seem tha
best developed in small forms, and that in anim
increased much in size from what may be considere
type, the organ is not found to have increased pro
though still retaining the typical sensory chara

hole extent. This peculiarity is well seen in the two species
ısyurus; in the small *D. viverrinus* the glands are few, while
e large *D. maculatus* they are very numerous. I am not
that sex has anything to do with the peculiarities of this
kable organ, concerning the function of which we know so

:he three Polyprotodont genera the nasal-floor cartilage and
ıer division or Jacobson's cartilage are very simple in
ıre and, as already pointed out, bear considerable resem-
to the simple Monotreme type of Echidna. In Echidna,
er, the organ is much better developed, as is also the carti-
By comparing the series of sections of the anterior region
obson's organ in Echidna, given in my paper on the organ
obson in the Monotremes, with the similar series from
rus (Pl. XLI.) there will be found no difficulty in tracing the
gy of the parts. In fig. 5 of the Echidna sections Jacob-
artilage is found on section to be C-shaped, with the upper
nd much thickened. By comparing this with Pl. XLI. figs.
ıd 11 from Dasyurus and Phascologale, it will be seen that
his thickened outer rim of the cartilage in Echidna that
es the outer bar of Jacobson's cartilage in Dasyurus. In
ıa, on passing backwards, the lower part of the C joins the
outer thickened bar (fig. 6), and a complete capsule is
l; and on tracing the outer thickened bar still further back
ınd to be continuous with the turbinal plate, and represents
ly the rudiment of a turbinal which once extended right
front of the organ, as is still seen in Ornithorhynchus. In
rus and other Polyprotodonts the main differences are
parently to the feebler cartilaginous development. The
ar is present at first in connection with the upper part of
on's cartilage as in Echidna, and almost immediately behind
ening of the organ the lower border of Jacobson's cartilage
round and becomes attached to it, but there is the difference
ırsupials that as a rule before the lower connection is
shed the upper has given way, so that there is usually for
t distance a detached bar, which on section is apparently

remains of a primitive turbinal.

In Didelphys and Perameles we have a short al
naso-palatine canal; while in Dasyurus it is ratl
oblique. In Perameles there is a small yet distin
process of Jacobson's cartilage in the notch betw
maxillary and its palatine process, a process which i
developed in all the Diprotodonts, and apparently tl
of the long anterior process which supports Jacob
the higher mammals of the Cat or Sheep type.
there is only a slight indication of this process; and
it is absent. From this we may consider that Da
more primitive. As regards the portion of Jacobs
supported by the palatine process all three gener
Dasyurus the support is on the lower edge and lowe
in Didelphys on the lower inner half; while in P
whole inner side of the cartilage is supported by
process. In neither of the latter two genera, ho
lower edge of the cartilage completely supported b
Dasyurus. In all three genera there is but a single
and as a rule the supply of mucous gland is scanty
is peculiar in having a small anterior prolongation
in advance of the opening, as well as in the extreme
of the secondary palate.

In the Phalangers we enter on a well differentiate
most remarkable points of difference from the previ

arnivorous Marsupials and but feebly indicated in Pera-
ıd there is also a very marked descending process by the
he naso-palatine canal in the notch. The ascending and
ng processes are well seen in their adult condition in
fig. 4, representing the condition in the adult Pseudo-
hile their mode of development is well seen in Plate XLV.
;ing the different stages of the young Trichosurus. By com-
'l. XLIV. fig 4. with, say Pl. XLIII. fig. 1,—the condition in
ıg Perameles, and fixing the two unquestionably homo-
ırts—the processes passing into the inferior septal ridges
vo additional processes will be readily seen. In the
ͅ condition of the palatine processes there is also a marked
e from that of any of the Polyprotodonts. In those
is always apparently developed as a small curved splint,
ng a considerable area of the cartilage. In the Phalan-
developed as a rod along the middle of the inner side of
ı's cartilage. This would lead one to assume that the
egion of Jacobson's cartilage in the Phalanger is probably
ous with the lower third of the cartilage in Dasyurus,
the region where the palatine process first developed.
be so the downward process in the Phalangers would
;he more manifestly an additional development.

posterior parts Jacobson's cartilage follows much the
es as in the Polyprotodonts. The outer part of the ridge
very early becomes separated into the outer bar of
ı's cartilage, which, after being isolated for a short dis-
ecomes attached to the under part of Jacobson's cartilage,
condition differs little from that of the Polyprotodonts.
ın itself is very similar to that in Dasyurus or Didelphys;
however, one very constant difference in that while in
rprotodonts there is only a single blood vessel running
e hilus, in the Phalangers there is a distinct plexus. At
eme anterior end there is usually one or two large veins,
e on passing backwards divide into four or five large sub-
anches which run parallel along the hilus. This is a
r met with in the Monotremes, but it is probably not of

any very deep significance, as in the Mouse there is but a single hilar vessel, while in the allied Guinea-pig there is a regular plexus Still it is interesting to note that the plexus is constant among the Phalangers, so far as known. The arrangement of mucous glands is very variable anteriorly; in Petaurus, Pseudochirus and Petauroides they are absent or scanty, while in Trichosurus they are abundant. As already observed, this is a point of little importance.

In Phascolarctus, not having examined the early conditions of the parts, it would be rash to say much on the relationships of the organ. Apparently the adult organ and cartilage differ very considerably from those in the Phalangers. Its most interesting points are – (1) the large proportional development of the nasal-floor cartilage; (2) the low position relative to the cartilage of Jacobson occupied by the palatine process; (3) the anterior development of the vomer; (4) the persistence of the cartilaginous roof; (5) the complete tube formed by Jacobson's cartilage; and (6) the presence of a plexus on the outer side of the organ. Whether as a parallel development or as indicating an affinity it is difficult to say, but there is a very decided resemblance in many ways to the condition in the Wombat.

In the Macropods, though there are features of resemblance to the Phalangers, both the ascending and descending processes of

ection in Didelphys (Pl. XLII. fig. 7) it will be seen that the eculiarity is only due to a slight difference in the relative osition of the naso-palatine canal In the low position occupied y the palatine process and the simple condition of the nasal-floor rtilage the Rat-Kangaroo comes considerably nearer the Polyrotodonts than does Macropus.

The Wombat in its early condition shows a very marked greement with Dasyurus, and also considerable agreement with Epyprymnus, though the organ opens in the usual way. In the lult the cartilaginous development is on the type of the Macrods, though the perfect cartilaginous tube formed by Jacobson's rtilage gives it more of the appearance of Phascolarctus.

CONCLUSION.

From the study of this limited region in the snout of the larsupials we get a number of interesting suggestions in the ay of apparent affinities. In the first place there can be little oubt in placing Perameles with Dasyurus and Didelphys and way from the Phalangers, and though it is more differentiated han either it seems to retain certain primitive characters lost in the others. The Phalangers are all closely allied, though it would seem that Trichosurus is a little further differentiated than Pseudochirus and Petaurus. Phascolarctus is a much modified and aberrant form, and it seems probable that a study of the fœtus will reveal that it is not so near the Phalangers as has been supposed. The Kangaroo group though allied to the Phalangers is, as regards the region under consideration, nearer the Polyprotodonts; and the Rat-Kangaroo, though slightly aberrant, helps to bridge over the gap. The Wombat is a very near ally of the primitive or ancestral Macropods apparently, though it has become much modified along an independent line.

I must acknowledge my indebtedness to Sir William Flower for the specimens of Didelphys examined; to Mr. A. G. Hamilton, of Mt. Kembla, N.S.W., for the young and adult Perameles; and to Prof. Wilson for the permission to examine his sections of the

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literature.

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REFERENCES TO PLATES.

a.J.o., anterior prolongation of Jacobson's organ; *a.n.*, alim gland; *J.c.*, Jacobson's cartilage; *J.o.*, Jacobson's organ; *l d.*, l duct; *Mx.*, maxilla; *n.*, nerve; *n.f.c.*, nasal-floor cartilage; *n.g* gland duct; *n.p.c.*, naso-palatine canal; *n.s.*, nasal septum; *o.b.J* bar of Jacobson's cartilage; *o.n.f.s.*, outer nasal-floor cartilage; *p.c.*, cartilage; *Pmx.*, premaxilla; *p.Pmx*, palatine process of premaxi ridge process of Jacobson's cartilage; *v.*, vein; *Vo.*, vomer.

Plate xli.

Dasyurus and *Phascologale.*

Figs. 1 - 4.—Transverse vertical section of Jacobson's organ and in *D. viverrinus* (mam. fœt., head length 15 mm.)

Figs. 5 - 9.—The same in *D. viverrinus* (two-thirds grown), × 12

Figs. 10-12.—The same in *Phascologale penicillata* (mam. fœt., he 9 mm.), × 36.

Plate xlii.

Fig. 8.—Transverse section of Jacobson's organ in *P. nasuta* (two-thirds grown), × 27.

Figs. 9-11.—Transverse section of region of Jacobson's organ in *P. nasuta* (adult), × 14.

PLATE XLIV.

Pseudochirus, Petauroides, and Petaurus.

Figs. 1-3.—Transverse section of region of Jacobson's organ in *Pseudochirus peregrinus* (mam. fœt., head length 8·5 mm.), × 40.

Figs. 4-7.—The same in *P. peregrinus* (adult), × 11.

Figs. 8-9.—The same in *Petauroides volans* (adult), × 10.

Figs. 10-12.—The same in *Petaurus breviceps* (adult), × 16.

PLATE XLV.

Trichosurus.

Figs. 1-3.—Transverse section of region of Jacobson's organ in *Trichosurus vulpecula* (mam. fœt., head length 7·5 mm.), × 36.

Figs. 4-6.—The same in *T. vulpecula* (mam. fœt., head length 10·5 mm.), × 42.

Figs. 7-9.—The same in *T. vulpecula* (mam. fœt., head length 20 mm.), × 18.

PLATE XLVI.

Trichosurus and Phascolarctus.

Figs. 1-6.—Transverse section of region of Jacobson's organ in *Trichosurus vulpecula* (adult), × 10.

Figs. 7-9.—The same in *Phascolarctus cinereus* (half grown), × 7.

PLATE XLVII.

Macropus and Æpyprymnus.

Figs. 1-3.—Transverse section of region of Jacobson's organ in *Macropus* sp? (early fœtus, body length 29 mm.)

Figs. 4-9.—The same in *M. ualabatus* (mam. fœt., head length 50 mm.), × 10.

Figs. 10-12.—The same in *Æpypyrmnus rufescens* (mam. fœt., head length 15·5 mm.), × 25.

PLATE XLVIII.

Phascolomys.

Figs. 1-2.—Transverse section of region of Jacobson's organ in *Phascolomys wombat* (fœtus, body length 19 mm.), after Röse, × 37.

Figs. 3-7.—The same in *P. mitchelli* (half grown), × 6.

Figs. 8.—The same in *P. mitchelli* (half grown), × 18.

ON A NEW SPECIES OF *MACADAMIA*, TOGETHER WITH NOTES ON TWO PLANTS NEW TO THE COLONY.

By J. H. Maiden, F.L.S., and E. Betche.

Macadamia integrifolia, sp.nov.

Small bushy tree, glabrous except the inflorescence and young shoots. *Leaves* petiolate, irregularly whorled in threes, oblong-lanceolate, entire, obtuse, about 5 to 7 inches long, strongly reticulate. *Flowers* in axillary simple racemes often as long as the leaves, generally in pairs irregularly clustered on the rhachis. *Pedicels* about 2 lines long, minutely pubescent. *Corolla* 2 to 3 lines long, nearly glabrous. *Hypogynous glands* united in a ring. *Ovulary* hairy, style glabrous or nearly so, with a clavate stigmatic end. *Fruit* globular, with a coriaceous exocarp and a hard endocarp, about ¾ inch diameter.

Hab.—Camden Haven, New South Wales. Collected about 30 years ago either by Mr. Charles Moore or Mr. Carron, a former Botanical Collector of the Sydney Botanic Gardens.

Closely allied to the Nut-tree, *Macadamia ternifolia*, F.v.M. (of New South Wales and Queensland), from which it is readily distinguished by the petiolate entire leaves, rather smaller fruits and less hairy flowers and inflorescence.

It may be pointed out that the sucker leaves have occasionally leaves with toothed margins, and shorter petioles, somewhat resembling the leaves of *M. ternifolia*, which shows the ancestral relationship of both species of *Macadamia*, but as the full grown leaves are constant in the characters indicated, and for other

Bentham and Hooker (Genera Plantarum, iii. 178) reduce these to two, pointing out that *M. verticillata* has been erroneously described as a *Macadamia* from a cultivated plant in the Botanic Gardens, Sydney, which has been proved to be a South African plant *Brabejum stellatifolium*, Linn. The species has since been lost to the Garden.

F. v. Mueller (Census of Australian Plants) recognises but one species of *Macadamia*, viz., *M. ternifolia*,—*M. Youngiana* being transferred to *Helicia*.

Baillon unites *Macadamia*, as well as several species hitherto described under *Helicia*, with the American genus *Andripetalum*, Schott (Baill. Vol. ii. p. 414). The characters of *Andripetalum* are ovules 2, descending, suborthotropous.

A. Engler (Die natürlichen Pflanzen-familien) recognises *Macadamia* 1 species in Australia; *Helicia* 25 species in Asia, Malayan Archipelago, and Australia; *Andripetalum* is not mentioned. We are, however, of opinion that Engler probably followed Baron von Mueller with regard to Australian plants of these genera.

Note on a Plant, hitherto only recorded from New Guinea, found in New South Wales.

Cheirostylis grandiflora, Blume, "Collection des Orchidées les plus remarquables de l'Archipel Indien et du Japon," Plate 13.

"In moist forests between rocks on the coast of New Guinea."

A plant of this species was collected by Dr. W. Finselbach on rocky hills "in a shady locality in the dense scrub," on the Richmond River, near Lismore. It will be seen that in New South Wales it grows under conditions practically identical with those under which it occurs in New Guinea It is a very pronounced saprophyte, growing on dead leaves. In fact some of the Richmond River specimens were living on a layer of leaves only $\frac{1}{4}$ inch thick, and under this layer was the bare rock. The upper side of the creeping rhizome is nearly always exposed to the light, or at all events to the air, and when it is found between stones the rhizome is always fixed to dead leaves.

cal with the *Anœctochilus* ("species unascertained having been found in Queensland. See Mueller edition, p. 188).

The genus *Anœctochilus* resembles *Cheirostylis* cl and the two genera may be easily confounded f material.

A shortened translation of Blume's original *Cheirostylis grandiflora* is given herewith, as convenience.

CHEIROSTYLIS GRANDIFLORA, Blume.

Herb with a creeping fleshy rhizome, constricte nodes. Scape ascending, terete, minutely glandul upper part and with two distant sheathing bract flowers and leaves. Leaves generally 4, ¾ to abo and ½ to ¾ inch broad, 3- to 5-nerved and fair brownish-green and somewhat purplish above, pal underneath. Flowers generally 3 on the scape, r shortly pedicellate and with a bract on the base Sepals connate to above the middle, with a gibl rose-coloured and minutely glandular-hairy ou adnate to the limb of the dorsal sepal. Labellum canaliculate gibbous base, adnate to the column, th base with inflexed margins and 4 filiform append each side, the exserted limb dilated, 2-lobed, with laciniate at the end. Column short, thick, with 2 er

Mitchell in his celebrated exploration of what is now
colony, and was described by Lindley. Our New South
ecimens came from Albury, and were communicated by
Burnell in August last. The flowers of our N.S.W.
are orange-red, merging into yellow in the upper half
sh-red," Mitchell), and nearly glabrous outside, as figured
Mag. t. 5007, and not villous outside as described by
Nevertheless Lindley's type specimens already
to have villous flowers, and are somewhat different in
ppearance from the Albury specimens. It might be a
r further investigation to ascertain to what extent the
variable before proceeding to name a variety. The
self is readily recognised by the remarkably long
us gland which projects almost horizontally into the
of the corolla (perianth).

DESCRIPTIONS OF SOME NEW ARANEIDÆ OI SOUTH WALES. No. 7.

By W. J. Rainbow.
(Entomologist to the Australian Museum).

(Plate xlix., figs. 1, 2, 3, 3*a*.)

The present paper contains descriptions of three specie science, and which, taken collectively, must form a addition to our knowledge of the Araneidan fauna of t tinent. Of these, ***Epeira coronata*** is exceedingly interes account of its extraordinary structure; the second *Pach superba*,—one of a small collection taken by Mr. Ogilby an excursion to Cooma, is a remarkably beautiful spi silvery granules that decorate the superior surface of the a appearing like jewels against the back-ground of dark The most important of the present series, however, is species of "flying" spider, for which I propose the nan *splendens*. In 1874 the Rev. O. P. Cambridge, F.Z.S., de and figured in "Annals and Magazine of Natural Histo

be found in the fact that not only are the corpulatory organs somewhat more complicated than in *A. volans*, but the legs of *A. splendens* are more numerously spined. When immersed in spirit the bright colours entirely disappear, but upon being withdrawn from the tube, and exposed to the atmosphere, the spider soon redisplays its gorgeous livery.

Family EPEIRIDÆ.

Genus Epeira, Walck.

Epeira coronata, sp. nov.

(Plate xlix., fig. 1.)

♀. Cephalothorax 4 mm. long, 3 mm. broad; abdomen 12 mm. in circumference.

Cephalothorax dark brown, convex, longer than broad. *Caput* moderately hairy, prominently elevated, summit surmounted with two lateral coniform tubercles, seated about four times their individual diameter from lateral eyes; normal grooves and indentations distinct. *Clypeus* moderately convex, dark brown, with faint lateral grooves radiating from the centre. *Marginal band* narrow.

Eyes black; the four comprising the central group forming a square or nearly so, and elevated upon a high and prominent tubercle; lateral pairs minute, placed obliquely on tubercles, and not contiguous.

Legs reddish-brown, hairy, moderately long, robust; relative lengths 1, 2, 4, 3; the first and second pairs are considerably the longest, and co-equal, and the third pair the shortest.

Palpi moderately long, robust, reddish-brown, and hairy.

Falces concolorous, robust, hairy; a row of three teeth on the margins of the furrow of each falx; fangs strong, reddish-brown at their base, wine-red at the points.

Maxillæ club-shaped, pale yellow, inclining inwards, a few short hairs at extremities.

Labium broad, short, rounded off at apex, reddish-bro base, pale yellowish at tip.

Sternum shield-shaped, brown, moderately clothed witl coarse hoary hairs.

Abdomen somewhat spherical, projecting over base of c thorax, moderately clothed with short hairy pubescenc surrounded with a corona of large and prominent tul inferior surface shiny black at anterior extremity, sid posterior extremity yellowish, with hoary pubescence.

Epigyne a transverse curved slit, the curvature directed fo

Hab.—New England; collected by Mr. A. M. Lea.

Family PACHYGNATHIDÆ.

Genus Pachygnatha, Sund.

Pachygnatha superba, sp. nov.

(Plate xlix., fig. 2.)

♀. Cephalothorax 2 mm. long, $1\frac{1}{2}$ mm. broad; abdomen long, 2 mm. broad.

Cephalothorax dark mahogany-brown. *Caput* slightly el arched, normal grooves distinct; a few long hairs surro ocular area. *Clypeus* broad, arched. *Marginal band* bro

Eyes of an opaline tint, arranged in two rows, slightly

Abdomen ovate, boldly projecting over base of cephalothorax. Colours: running down the centre from anterior, and terminating close to posterior, extremity is a broad pale yellowish patch, slightly broadest in front, and moderately and finely punctated; the patch is broadest at its anterior extremity and bordered in front and laterally with a sinuous line of bright silvery granules; laterally the colour is dark mahogany-brown; inferior surface brown, but a shade lighter in tint.

Epigyne a simple transverse slip.

Hab.—Cooma*; collected by Mr. J. D. Ogilby.

The position of the genus *Pachygnatha* in the system of the classification of the *Araneidæ* is not yet finally determined. Certain authors, as Westring, Ohlert, Simon, Lebert, and others associate it with the family *Theridiidæ*, but Thorell points out that the spiders of the genus *Pachygnatha* deviate from the typical *Theridiidæ*; Bertkau considers the genus as representing an independent group, to which he also refers the genus *Tetragnatha*; Menge, that it forms an independent family, of which it is the sole representative; finally, Staveley associates the genus *Pachygnatha* with the family *Linyphiidæ*. In commenting upon this question Wagner remarks that the study of these spiders, which is very incomplete, has led him to the conclusion that the grouping of Menge is the nearest approach to the truth, but in adopting Menge's classification, he does not consider the question settled, and accepts provisionally the position allotted by that author to this genus.† After giving the subject considerable thought and study, I have also come to the conclusion that Menge's elucidation of the position is the most correct, and consider it not unlikely that it will ultimately be accepted.

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* This species appears to have a very wide range. Since the above was written I have received a specimen from Gisborne, Victoria, Mr. George Lyall, Junr., having collected it at that locality.

† Mém. de l'Acad. Imp. des Sci. de St. Pétersbourg, viie Série, Tome xlii., No. 11. L'Industrie des Araneina: Recherches de Woldemar Wagner, 1894, p. 150.

(Plate XLIX. figs. 3, 3*a*.)

♂. Cephalothorax 2½ mm. long, 2 mm. broad; a
long, 2 mm. broad.

Cephalothorax steel-blue, broad, glossy. *C*
banded across the front with a broad curved
scarlet granules and scale-like hairs, the curvat
wards; in front, and surrounding the anterior ro
is a brush of short tawny hairs. *Clypeus* bro
flat, narrowest at its posterior extremity; at the
cephalic and thoracic segments there is a broad
shallow depression, surrounded by a series of fou
hairy brushes, the outer margins of which are s
tawny hairs; sides steel-blue moderately clothed w
Marginal band fringed with hoary pubescence.

Eyes arranged in three rows, and nearly for
those of the front row of a bright emerald g
the two median eyes are sensibly the largest; the
the second row are much the smallest of the gr
of a bright emerald green; the third row are so
than the lateral eyes of the anterior series, and a
tint.

Legs moderately long and strong, yellow-brow
hoary hairs, and armed with short stout spines;

Falces dark brown, conical, divergent at apex, seated well back behind the frontal margin.

Maxillæ, labium, and *sternum* concolorous.

Abdomen oblong, narrowest in front, slightly overhanging base of cephalothorax, truncated at posterior extremity; upper side furnished (as in *A. volans*, Camb.) with an epidermis, which is continued laterally on either side to an extent considerably exceeding the width of the abdomen, and of an elliptical form; the outer portion of this epidermis on either side is capable of being depressed and folded round beneath the abdomen, or elevated and expanded to its full width after the manner of wings. The whole of the epidermis is densely covered with short and scale-like hairs, which give the different tints and hues to the abdomen; in the front and at the sides the colour is bright green; upon the upper surface there is a large oval ring of scarlet, the inner margins of which are bordered with bright green granules; in the centre there is a large patch of reddish-grey, surrounding a smaller and somewhat oval patch of scarlet; immediately below posterior margin of the scarlet oval ring there is a short, broad transverse patch covered with green granules, and fringed sparingly at ultimate extremity with scarlet scale-like hairs; lateral flaps furnished with bright green granules and scale-like hairs, becoming less brilliant towards their ultimate extremities; under side of a greenish grey colour, thickly clothed with short scale-like hairs.

Hab.—Sydney.

EXPLANATION OF PLATE.

Fig. 1 —*Epeira coronata*, ♀.
Fig. 2 —*Pachygnatha superba*, ♀.
Fig. 3 —*Attus splendens* ♂.
Fig. 3a— ,, ,, showing epidermis folded under.

deepening to dark brown at ultimate extremity; eyes dark brown; legs yellow.

Cephalothorax strongly arched, glossy, rather longer than broad, narrowest in front; anterior margin strongly indented; a deep longitudinal groove runs down the centre from anterior to posterior extremity, and separates the median eyes; these latter are seated on dark brown tubercles; the surface is smooth above, and has but few punctures; the sides are rather thickly furnished with minute granules; near the posterior extremity there are deep lateral compressions and grooves, and the minute darkish granules produce rather a dull tint; a few very fine yellowish hairs fringe the anterior extremity. *Marginal band* narrow and free from hairs.

Tergites keeled in the median line, minutely granulated, and fringed with a few short yellowish hairs; the final tergite is also keeled both above and laterally, the lateral keels seated low down.

Sternites glossy, with deep median and lateral depressions and minute punctures; the final sternite keeled laterally.

Tail long, glossy, almost parallel-sided, the segments deeply grooved, and strongly keeled and granulated laterally; sides and inferior surface strongly keeled and granulated; the segments vary in length, each succeeding one being longer than its predecessor, and the final one much the longest of any; each segment sparingly fringed laterally and underneath with rather long and fine yellowish hairs. *Vesicle* flat and glossy above, strongly arched, keeled and grooved laterally, the keels granulated; inferior surface sparingly furnished with yellow hairs, strongly keeled and grooved, the keels granulated. *Aculeus* moderately long and strong, gently incurved; *vesicle* and *aculeus* taken together are considerably shorter than the fifth caudal segment.

Legs yellow, sparingly clothed with long yellow hairs; femora and trochanters firmly keeled and granulated underneath; tibiæ, metatarsi, and tarsi armed with short strong spines.

Palpi long, powerful, fringed with short yellowish hairs; superior surface of humerus, brachium, and manus keeled and

the median line; brachium granulated laterally,
down the middle; manus thick, moderately long, p
and granulated underneath; hand-back keeled, bro
granulated; fringes short, powerful, incurved, t
granules giving them a somewhat darker appear
hand; movable finger somewhat the longest.

Pectines long, somewhat tapering, and furnished

Measurements (in millimeters):—Total length,
cephalothorax 6, width in front 3, behind 5; length
first segment 3, second 3½, third 4, fourth 5, fifth
aculeus 5; length of humerus 5; of brachium 5; l
back, 6; movable finger, 4½; width of humerus, 2
2½, of hand (at base) 4, at apex 3; of hand-back, 3.

Hab.—Cooma.

EXPLANATION OF PLATE.

Fig. 4. —*Buthus flavicruris.*

Fig. 4*a*.— ,, ,, tail, profile.

Fig. 4*b*.— ,, ,, first and second caudal se
surface.

REVISION OF THE GENUS PAROPSIS.

By Rev. T. Blackburn, B.A., Corresponding Member.

Part I.

Paropsis is probably the most numerously represented in Australia of the Coleopterous genera, and there is certainly no genus in greater need of revision or presenting greater difficulties to the task of revision. In attempting the task I cannot hope to execute it in a final manner owing to the large number of species that have been described in such fashion that it is impossible to identify them without seeing the types, and of the types there is little doubt many have perished, while the rest are so scattered over public and private collections as to preclude the examination of them by any individual reviser.

The species of this genus are extremely difficult to identify for another reason, viz., their great variability in respect of colour and markings. There is no species of which I have seen a long series in which I do not find more or less variability, and therefore it is necessary for the describer, if his work is to be of value, to base his specific distinctions almost entirely on structural characters, on form, and on sculpture.

In dealing with the enormous mass of species constituting the genus *Paropsis* the first step must necessarily be to divide the species into primary groups, and for this division I have come to the conclusion that in the main the best character to rely upon is that which Dr. Chapuis proposed for the purpose (Ann. Soc. Ent. Belg. xx.), viz., the sculpture of the elytra, for the adoption of any other character (that I have experimented with) disregards too radically the obvious affinities of species or fails by merely separating a few groups of very small extent and leaving the

great majority of the species to form one vast group. I think, however, that there is one character founded on form that may be profitably employed in constituting primary groups, viz., the shape of the prothorax, as there is a large number of species obviously allied *inter se*, the sides of whose prothorax are mucronate in front (in many instances bisinuate) and very few indeed possessing this character which there can be any hesitation in regarding as naturally allied to them. In following Dr. Chapuis' system of groups I have, however, found it desirable to modify it by somewhat increasing the number of primary groups, and also transposing the position of some of his groups, as I feel confident that the natural place of his fourth group is immediately after his first group. I propose, therefore, the following division of the genus into primary groups :—

A. Sides of the prothorax mucronate in front (in many species bisinuate) .... Group i.

AA. Sides of the prothorax evenly arched.

B. Puncturation of the elytra without any linear arrangement..... .... Group ii.

BB. Puncturation of the elytra more or less linear in arrangement.

C. About 20 more or less regular rows of punctures

The present memoir begins with Group iii. I have already read a paper to the Royal Soc. of S.A. (Tr. Roy. Soc. S.A. 1894) on Dr. Chapuis' Group i. (my i. and ii.), but during the interval since its publication so many new species of that group have come into my hands that it will be desirable to deal with it afresh, and as the new material throws fresh light on and modifies a considerable part of the work there seems to be almost a necessity for rewriting my paper on it. This, however, I purpose postponing until I have finished my work on the other groups, and, therefore, I begin with the first group that has as yet received no systematic treatment.

The section of *Paropsis* to be now dealt with,—that containing the species with about 20 rows of punctures, and also with *verrucæ*, on each elytron,—is for more than one reason, the most difficult in the genus to treat satisfactorily. It is one of the two sections containing a very large number of species, the species appertaining to it are mostly obscure, closely allied and very variable, and many of those already named are described in a manner that completely defies identification.

Dr. Chapuis (*loc. cit.*) enumerates 42 species as forming this group, but there are doubtless others among the 43 species enumerated by him as unable to be referred to a definite place in *Paropsis*. Since the publication of Dr. Chapuis' memoir only 5 species have been added. Dr. Chapuis' descriptions are far from satisfactory, because they are mere diagnoses without any notes of comparison between one species and another, and because they deal with colour and marking to an extent that is misleading in dealing with variable insects. I have, however, been fortunate enough (through the courtesy of M. Sevrin, of Brussels) to secure a considerable collection of types and named specimens from Dr. Chapuis' collection, without which I could not have ventured on the present work, but even with this assistance there is an unsatisfactory number of names that I have been compelled to disregard totally as incapable of identification with any particular species; many of the descriptions annexed to them might refer to almost any species of the group.

incurva, Clk. *infuscata*, Ch|
cancellata, Chp. *fusconotata*, C

Concerning the following species, I feel cons: They are all more or less insufficiently describ appear (judged by the descriptions) to have ar characteristics; in fact they might be almost any o number of species before me, and it is quite possil redescribed some of them;

rugulosa, Boisd. *corrugata*, Ch
coriaria, Chp *rufo-nigra*, Cl
spilota, Chp.

P. papulenta, Chp., (*papulosa*, Stäl, nom. præocc be founded on the same insect as *rugosa*, Chp. cription is insufficient to furnish ground for mu guess.

P. atomaria, Oliv., is possibly a member of *Paropsis* but cannot be identified by the descriptic is not certain that it was taken in Australia, as O is "Islands of the South Seas."

P. aspera, Chp., attributed by its author to th extremely anomalous species of which I have a spe Chapuis collection. I have, however, removed it on account of the front angles of its prothorax be

Owing to the variability and close alliance *Paropses* of this group I have found it necess specific distinctions almost entirely on structural ch

upon a method of characterising the form that will render it practically available. The difference of form between one species and another is best observed by looking at the specimen from the *side*, and when a number of species of this group are examined they are found to present two very different types of outline; the one in which the arch of the upper outline has its summit near the front of the elytra and thence curves away continuously downwards to the apex, the other in which the summit is considerably further back. To express this distinction clearly I have called this summit of the curve the point at which the insect is at its "greatest height;" and as it is easier for the eye to determine the middle of a straight line than of a curve I have called the middle of the *lower* outline (as viewed from the side, whence it appears as a straight line) "the middle of the elytral margin." Thus I have formed two main divisions of the *Paropses* of this group on the position of the "greatest height" in relation to the "middle of the elytral margin;" it being in the one case opposite a point considerably in *front* of the "middle of the elytral margin," in the other case opposite a point just about (or a little behind) the middle. It must be noticed that this character is slightly affected by sex, the "greatest height" being usually a little further back in the female than in the male, but this does not invalidate the divisions founded upon it, as I find that even in the females of the one group the "greatest height" is markedly nearer the base of the elytra than in the males of the other group, and there are very few species sufficiently intermediate to cause any difficulty. With a little practice and comparison of specimens I think this character will be found quite easy to appreciate. This difference of form then I take as the character on which primary divisions of this group of *Paropsis* should be based, after first eliminating from the crowd of species a few possessing altogether exceptional characters on the strength of which I treat them as forming a separate division. These exceptional characters need no explanation and will be easily recognised by the student; the aggregate that they bring together is entirely artificial, but the convenience of forming it is obvious.

of the evenness or otherwise of the *surface*), *i e.*, the disc continues unchanged to the extreme la the rest of the species the convexity becomes more or less wide marginal space. In these latt thorax "explanate at the sides." On the elytra the humeral callus and the lateral margin presen in some species being flattened (or even concave) at from a certain point of view) there appea (roughly triangular, the humeral angle of the el apex of the triangle) on a more or less different of the general surface; in the other species th elytra continues quite uninterruptedly the gen surface. I characterise the former of these "depressed under the humeral callus."

Another character calling for remark is th marginal portion (which is the external surface of the elytra to the disc. In most species the dis these is indicated by a lightly impressed ill-defi concavity (generally most noticeable for a short apex). I have called this concavity the "subma

And yet another character requires comment, of the epipleuræ of the elytra. These consist of a less horizontal piece (generally a mere fine line in it an external more or less vertical piece. The heig piece varies greatly in different species, but is the individuals of a species. Its height, howev

from the suture, while in others it is much nearer to the external margin.

It will be observed that in the following descriptions I have in some instances mentioned only characters in respect of which a species differs from some other to which it is closely allied and added the statement "cetera ut . . . " (an instance of this occurs in the description of *P. extranea*). I have adopted this course to avoid needless repetition, but it will be well to state explicitly here that in every such case I have carefully compared the insect on which the abbreviated description is founded with the detailed description preceding it (in the case of *P. extranea*, *e.g.*, with the description of *P. sternalis*), and ascertained that the whole of the detailed description applies to it except in respect of the characters noted in the abbreviated description.

I divide this group of *Paropsis* (distinguished by having the sides of the prothorax neither mucronate in front nor bisinuate, and each elytron with about 20 rows of punctures and also some verrucæ) then into subgroups as follows :—

A. Species with strongly marked characters (as detailed in the tabulation of species).. Subgroup i.
AA. Species not referable to Section A.
  B. The greatest height of the insect (viewed from the side) not or scarcely in front of the middle of the elytral margin.
    C. Elytra depressed under the humeral callus......... Subgroup ii.
    CC. Elytra not depressed under the humeral callus. Subgroup iii.
  BB. The greatest height of the insect (viewed from the side) considerably in front of the middle of the elytral margin.. Subgroup iv.

This first part of my "Revision of the genus *Paropsis*" deals with the first three of the subgroups into which I divide the group. I begin with a tabulated statement of the distinctive characters of the species in Subgroup i., and then proceed to furnish descriptions of the new species enumerated in the tabulation. Afterwards I treat Subgroups ii. and iii. similarly. The names printed in italics are the names of those species which I have etermined by studying the descriptions without having

seen an authentic type. It is possible that there may be inco identifications among these; but I think not since they a species described as presenting well marked characters.

I have to thank many friends for their courtesy in lendin their collections for study and comparison, especially Mr. Mas to whom I fear I have given much trouble by my enq regarding types in the Macleay Museum, and who has don the great favour of sending me specimens carefully compared those types, whereby the reliability of my memoir has been v increased, making him really a co-worker with me in the duction. I have had the privilege also of examining the follo collections, viz., S.A. Museum, Agricultural Department of N South Wales and Agricultural Bureau of W. Australia, toge with the collection of Mr. A. M. Lea; also numerous specim forwarded by Mr. A. Simson, Mr. C. French, Mr. W. W. F gatt, and the late Messrs. Olliff and Skuse.

TABULATION OF THE SPECIES FORMING SUBGROUP I

A. Prosternum not sulcate down the middle.. .. .. insolens, Blackb

AA. Prosternum sulcate down the middle; but very wide, and scarcely narrowed in front.

B. Colour testaceous or red, elytra moderately punctured.

C. Prothorax at its widest much behind the

C. Form oblong, very little convex.............. scabra, Chp.
CC. Form broadly ovate, strongly convex...... rugosa, Chp.
BBB. The exceptional characters lie in the elytral epipleuræ.
C. Epipleuræ subhorizontal .... armata, Blackb.
CC. Inner (horizontal) part of epipleuræ nearly reaches the apex as a distinct ledge.
D. Basal ventral segment coarsely punctured.
E. Sides of prothorax strongly explanate.
F. Underside testaceous .... Chapuisi, Blackb.
FF. Underside black.
G. Interstices of elytral punctures but little rugulose.................. latipes, Blackb.
GG. Interstices of elytral punctures strongly rugulose, almost concealing the punctures............ raucipennis, Blackb.
EE. Sides of prothorax only slightly explanate .... Karattæ, Blackb.
DD. Basal ventral segment feebly punctulate.
E. Elytra with a postbasal discal impression.
F. The marginal part of elytra moderately wide and more or less vertical.
G. Size very large (Long. 6 lines) suture and some vittæ black...... *graphica*, Chp.
GG. Size much smaller (Long. 5 l.) suture concolorous with general surface.......................... rustica, Blackb.
FF. The marginal part of the elytra very wide and very strongly outsloped.................................... læviventris, Blackb.
EE. Elytra without any postbasal impression on disc........................... sublimbata, Chp.

P. INSOLENS, sp.nov.

♀. Elongato-ovalis vel sat late subparallela, modice convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; subnitida; rufa, hic illic picescens; capite fortius minus crebre punctulato; prothorace quam longiori ut $2\frac{1}{3}$ ad 1 latiori, ab apice longe ultra medium dilatato, pone

antice suturam versus subseriatim verr
(latera versus crebre confuse verrucosis),]
quam depressæ magis rufis, parte margin
distincta (margine summo nihilominus præt
calli humeralis margine interno a sutura qu
margine laterali multo magis distanti; se
basali subtiliter sparsissime punctulato; elyt
subhorizontalibus; prosterno medio haud
concavo. Long. 6, lat. $4\frac{1}{5}$ lines.

Quite incapable of confusion with any other
to me.

W. Australia; sent to me by Mr. French.

P. STERNALIS, sp.nov.

♀. Ovalis, modice convexa, altitudine majori (a
elytrorum marginem medium posita; mint
castanea, in prothorace maculis 4 (transve
in elytris verrucis numerosis nigris; capite
prothorace sat crebre fortiter (ad latera gros
hoc quam longiori plus quam duplo (ut $2\frac{4}{7}$
apice longe ultra medium dilatato, pone api
vix impresso, lateribus leviter arcuatis l
angulis posticis rotundatis; scutello nitido
sub callum humeralem vix depressis, pa
transversim vix impressis, crebre subseriati
prothorax paullo magis ad latera quam in

Easily distinguishable by its uniform flavo-castaneous colour interrupted only by the black spots on the prothorax and verrucæ on the elytra together with its very broad prosternal longitudinal furrow, which is quite as wide as in *P. geographica*, Baly. The humeral callus is extremely feeble.

N. Territory of S. Australia.

P. EXTRANEA, sp.nov.

♀. Altitudine majori ad medium (vel fere pone medium) elytrorum posita; obscure brunneo-rufa, ut *P. sternalis* nigronotata; prothorace in disco minus crebre punctulato, antice fortiter angustato, lateribus fortiter rotundatis; elytrorum callo humerali sat prominenti, puncturarum interstitiis apicem versus sat rugulosis; cetera ut *P. sternalis*.

Very like *P. sternalis* but at once distinguishable from it (apart from colour) by its greatest height being not at all in front of the middle, by its prothorax being much less closely punctulate on the disc with its sides much more strongly rounded and its front part much more narrowed, and by its much better developed humeral calli.

N. S. Wales ; I do not know the exact habitat.

P. SQUIRESENSIS, Blackb.

♂. Leviter ovata; minus lata; modice convexa, altitudine majori (a latere visa) contra elytrorum marginem medium (vel etiam magis retro) posita; sat nitida; nigra vel nigropicea, capite antennis pedibus (elytrorumque verrucis nonnullorum exemplorum) plus minusve rufescentibus; capite crebre subtilius punctulato; prothorace quam longiori ut 2¼ ad 1 latiori, ab apice ultra medium dilatato, pone apicem transversim impresso, inæqualiter (in disco puncturis majoribus cum aliis minoribus intermixtis, ad latera confertim grosse) punctulato, lateribus minus arcuatis nullomodo deplanatis, angulis posticis obtusis; scutello lævi vel vix punctulato; elytris sub callum humeralem leviter depressis, pone basin transversim impressis, crebre fortiter sat seriatim

ralis margine interno a sutura quam ab ely
laterali multo magis distanti, segmento
(maris sat fortiter feminæ subtilius) punct
parte concava mediana lata. Long. 3-$3\frac{3}{4}$, la
Femina quam mas paullo magis convexa.

Easily distinguishable (among the species wi
space of the prosternum exceptionally wide) by t
colour of the general surface, the elytral verruca
reddish but not conspicuously different in colour
The elytral margin viewed from the side is very
strigosa and a few other species). I have though
describe this species as the acquisition of more s
some variation from the type, especially in colour.

N. W. Australia; sent to me by Mr. Maste
viously taken by the Elder Exploring Expedition.

P. ARMATA, sp.nov.

♀. Sat late subovata; minus convexa, altitu
latere visa) haud ante elytrorum marginem
minus nitida; supra rufo-aurantiaca, protho
exceptis) scutello et elytrorum tubercu
picescentibus; subtus picescens, antennarum
rufis; capite sat fortiter ruguloso; prothorac
ut $2\frac{1}{3}$ ad 1 latiori, ab apice vix ultra mediun
apicem transversim vix impresso, gross
ruguloso et sparsim punctulato, lateribus

terno a sutura quam ab elytrorum margine laterali multo magis distanti; segmento ventrali basali sparsius minus subtiliter punctulato; epipleuris subhorizontalibus. Long. 5, lat. $3\frac{4}{5}$ lines.

Somewhat resembles *P. insolens;* its most striking character consists in the structure of the epipleuræ; in most *Paropses* these (as noted above) consist of an inner horizontal ledge and an external almost vertical piece, but in the present species (and even more markedly in *P. insolens*) the two pieces are narrow and scarcely distinct *inter se* and form an almost evenly continuous surface outturned so as to be obliquely subhorizontal.

N. S. Wales.

P. CHAPUISI, sp.nov.

♂. Late ovalis, modice convexa, altitudine majori (a latere visa) sat longe ante elytrorum marginem medium posita; minus nitida, castanea, antennis ultra medium prosterno elytrorumque verrucis infuscatis; capite crebre subtiliter punctulato; prothorace quam longiori plus quam duplo (ut $2\frac{1}{2}$ ad 1) latiori, ab apice longe ultra medium dilatato, crebre sat subtiliter subæqualiter (sed ad latera subgrosse) punctulato, pone apicem transversim distincte impresso, lateribus sat late deplanatis sat fortiter arcuatis, angulis posticis nullis; scutello leviter sparsissime punctulato; elytris sub callum humeralem triangulariter distincte depressis, paullo pone basin leviter distincte transversim late impressis, crebre sat fortiter sat æqualiter (latera versus vix magis crasse) punctulatis, verrucis parvis nonnullis apicem versus instructis, parte marginali lata a disco (sulculo manifeste impresso sed paullo ante medium interrupto hinc ad apicem continuo) divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali haud magis distanti; epipleurarum parte interna (horizontali) fere ad apicem (ut dorsum distinctum) continua; segmento ventrali basali fortiter subgrosse punctulato, apicali emarginato, incisuræ facie postica subverticali. Long. 5, lat. $4\frac{1}{4}$ lines.

Very distinct among its near allies by its entirely (the infuscate prosternum excepted) pale castaneous under surface in combination with a coarsely punctured basal ventral segment and widely explanate sides of prothorax. I have seen only a single specimen, which is from Dr. Chapuis' collection, and is ticketed "*papulosa.*" *P. papulosa*, Er., however, is a much smaller and very differently sculptured insect, while *P. papulosa*, Stal, is also much smaller and very differently sculptured (especially in having the whole of the elytra thickly studded with verrucæ). I think Dr. Chapuis was certainly mistaken in calling this species *papulosa*.

Australia.

P. RAUCIPENNIS, sp.nov.

♀. Late ovalis, valde convexa, altitudine majori (a latere visa) vix ante elytrorum marginem medium posita; minus nitida, castanea, prothoracis maculis nonnullis elytrorum sutura (verrucisque nonnullis) et corpore subtus (coxis abdominisque apice exceptis) nigris, antennis (basi excepta) infuscatis; capite crebre minus subtiliter punctulato; prothorace quam longiori multo plus quam duplo (fere ut 2⅔ ad 1) latiori, ab apice paullo ultra medium dilatato, crebre minus subtiliter (in disco paullo minus crebre, ad latera sat grosse) punctulato cetera ut præcedentis (*P. Chapuisi*); scutello medio opaco confertim punctulato, elytris crebre granulatis rugulosis sic

the side) evidently nearer to the base. In both this species and the preceding the continuance of the shallow sulciform impression (which marks the distinction between the discal and marginal regions of the elytra) to the actual apex causes the appearance, when the insect is viewed from the side, of the suture being produced hindward in a short mucro.

S. Australia.

P. KARATTÆ, sp.nov.

♀. Late ovalis, modice convexa, altitudine majori (a latere visa) sat longe ante elytrorum marginem medium posita; minus nitida; castanea (prothoracis maculis nonnullis, elytrorum sutura disci margine externo et verrucis numerosis regulariter seriatim positis, corporeque subtus maculatim, nigris), antennis apicem versus infuscatis; capite prothoraceque (colore excepto) fere ut *P. Chapuisi*, sed hujus lateribus vix manifeste deplanatis; scutello puncturis nonnullis impresso; elytris sub callum humeralem triangulariter distincte depressis, pone basin vix manifeste impressis, crebre subreticulatim rugulosis sed minus distincte punctulatis, sulculo subhumerali minus determinato et ante apicem ipsum toto deficienti, calli humeralis margine interno a sutura quam ab elytrorum margine laterali manifeste magis distanti: epipleuris et segmenti basalis ventralis sculptura ut *P. Chapuisi*. Long. 5, lat. $4\frac{1}{5}$ lines.

Distinguished among its near allies (apart from probably variable characters) by the sides of its prothorax markedly less explanate, the feebleness of the distinction between the elytral disc and margins (the submarginal sulcus failing entirely before the apex so that viewed from the side there is no appearance of a sutural projection), and the humeral callus with its inner margin considerably nearer to the lateral margin than to the suture. The sculpture of the elytra resembles that of *P. raucipennis* in consisting of rugulosity mostly concealing the puncturation but it is feebler and less granulose than in that species so that the puncturation is not quite so much obscured.

Kangaroo Island.

minus nitida; rufo-brunnea (elytrorum ve
sat æqualiter, nec regulariter seriatim, disp
nonnullis indeterminatis et sternis epip
antennis apicem versus infuscatis); capi
fere ut *P. læviventris* sed hoc magis transv
lateribus vix deplanatis minus fortiter arc
depressione humerali, sulculo submargina
minus abrupte interrupto), impressione
pleuris ut *P. Chapuisi*; elytris sat fortite
crebre punctulatis, interstitiis in disco vix (
rugulosis, parte marginali sat grosse ru
ventrali basali subtiliter punctulato. Lo
(vix).

Near *P. sublimbata*, Chp., but at once distin
very much coarser puncturation of the elytra a
greatest height (viewed from the side) being m
the front and by the elytral verrucæ being
more conspicuous, more numerous, and less regu
elytral apex (viewed from the side) projects as i
N. S. Wales; taken by Mr. Lea at Forest R

P. LÆVIVENTRIS, sp.nov.

♂. Sat late ovalis, minus convexa, altitudin
visa) paullo ante elytrorum marginem me
nitida; castanea (elytrorum macula elongat

in lateribus sat grosse, alibi magis crebre) punctulato, pone apicem transversim distincte impresso, lateribus leviter deplanatis sat fortiter arcuatis, angulis posticis nullis; scutello sublævi; elytris sub callum humeralem triangulariter leviter depressis, paullo pone basin leviter distincte transversim impressis, sat crebre sat distincte subseriatim (latera versus vix magis fortiter) punctulatis, interstitiis sat fortiter rugulosis, verrucis sparsis minus conspicuis series duas (in interstitiis circiter 5° 9°que positis) formantibus, parte marginali callo humerali et epipleuris ut *P. Chapuisi;* segmento ventrali basali minus perspicue punctulato.

♀. Manifeste magis convexa (exempli typici sternis piceis potius quam nigris). Long. $3\frac{4}{5}$-$4\frac{1}{2}$, lat. 3-$3\frac{2}{5}$ lines.

Smaller and more nitid than any of its immediate allies. Easily distinguishable by the characters specified in the tabulation and by the large blackish blotch resembling a more or less wide dilatation of the anterior one-third portion of the suture. Viewed from the side the apex of the elytra appears to project as in *P. Chapuisi.*

S. Australia ; near Adelaide.

TABULATION OF THE SPECIES FORMING SUBGROUP II.

A. Inner edge of humeral callus distinctly nearer to lateral margin of elytra than to suture.
  B. Sides of prothorax more or less explanate.
    C. Elytra not having well-defined continuous costæ.
      *D. Puncturation of elytra not particularly fine.
        E. Upper surface of elytra in general, or at least the verrucæ, black or nearly so.
          F. Explanate margins of prothorax wide (each about $\frac{1}{3}$ of width of discal part).
            G. Postbasal impression of elytral disc feeble.

* In *P. externul* the elytral puncturation is not very much finer than in the species under the letter.

H. Prothorax at its widest notably behind the middle.

I. Elytral puncturation (or at least its seriation) much obscured, especially behind, by close rugulosity of the interstices .... *explanat*

II. Elytral puncturation well defined, and seriate to apex.

J. Legs testaceous.

K. Form very wide; elytra strongly rounded at sides regulari

KK. Form much less wide; elytra less rounded at sides .... comma,

JJ. Legs dark.. .... sylvicol

HH. Prothorax at its widest at the middle........................ .. *melanos*

GG. Postbasal impression of elytral disc very strong.................. baldiens

FF. Explanate margins of prothorax much narrower.

G. Median verrucæ of prothorax scarcely defined.

H. Prothorax dark in the middle, the sides pallid in strong contrast . . . . piceola,

II. Elytral verrucæ much less distinct, confused (especially in front) with interstitial rugulosity.
J. Puncturation of prothorax close and asperate; form strongly convex..... .... mixta, Blackb.
JJ. Puncturation of prothorax not close and asperate; form much less convex.
K. Postbasal impression of elytra almost wanting ... sordida, Blackb.
KK. Postbasal impression of elytra well defined...... foveata, Blackb.
GG. Median verrucæ of prothorax tuberculiform................ ...... *verrucicollis*, Chp.
EE. Upper surface (including verrucæ, which are very large) red or brown.
F. Prothorax not much narrowed in front, widest at the middle .... montuosa, Blackb.
FF. Prothorax much narrowed in front, widest considerably behind middle rosea, Blackb.
DD. Puncturation of elytra decidedly fine.
E. Prothorax not much narrowed in front, widest at middle .... exsul, Blackb.
EE. Prothorax much narrowed in front, widest considerably behind middle.
F. Size moderate (Long. 3⅜ l.) .... simulans, Blackb.
FF. Size very small (Long. 2¼ l.)......... abjecta, Blackb.
CC. Elytra with well defined continuous costæ *ferrugata*, Chp.
BB. Sides of prothorax not at all explanate.
C. Elytra not having a well defined transverse wheal-like ridge.
D. Form nearly circular; elytra wider than long.. mediocris, Blackb.
DD. Form less wide; elytra not wider than long.
E. Prothorax with somewhat evenly rounded sides; only moderately narrower in front than at base.
F. Puncturation of elytra not particularly fine and close.

G. Disc of prothorax closely and evenly punctulate.

H. Prothorax at its widest markedly behind the middle .. .. ruficollis, I

HH. Prothorax at its widest at the middle .. . . propria, Bl

GG. Disc of prothorax (especially in in the middle) considerably less closely punctulate .... whittonens

FF. Puncturation of elytra exceptionally fine and close.

G. Submarginal part of elytra very distinct near apex... . .. . cribrata, B

GG. Submarginal part of elytra not distinct ... . declivis, B

EE. Prothorax widening from apex almost to base; base much wider than front margin.

F. Puncturation of elytra not particularly fine.

G. Elytral verrucæ large, scarcely elevated, isolated, very nitid and black . . . . Tatei, Bla

GG. Elytral verrucæ not as in *Tatei*.

H. Surface of elytra (disregarding the verrucæ) only moderately rugulose

II. The elytral verrucæ very conspicuous and pallid .... solitaria, Blackb.
HH. Surface of elytra (disregarding the verrucæ) closely granulose-rugulose even at the base lima, Blackb.
FF. Puncturation of the elytra exceptionally fine .... invalida, Blackb.
CC. Elytra having a well-defined transverse wheal-like ridge .... transversalis, Blackb.
AA. Inner edge of humeral callus equidistant between suture and lateral margin of elytra exarata, Chp.

P. COMMA, sp.nov.

Sat late subovata, modice convexa, altitudine majori (a latere visa) contra marginem medium (vel paullo magis antice) posita; sat nitida; ferruginea, capite postice prothoracis maculis 2 (his figuram comma simulantibus) et elytrorum verrucis nigris, lateribus dilutioribus, corpore subtus nigro (rufo-variegato) antennis basi excepta piceis; capite subtilius subrugulose punctulato; prothorace quam longiori ut $2\frac{2}{3}$ ad 1 latiori, ab apice sat longe ultra medium dilatato, pone apicem transversim minus perspicue impresso, sat fortiter vix confertim (ad latera grosse rugulose) punctulato, lateribus fortiter arcuatis late leviter deplanatis, angulis posticis nullis; scutello sublævi; elytris sub callum humeralem leviter depressis, pone basin transversim leviter impressis, fortiter sat crebre subseriatim (ad latera paullo magis, postice paullo minus, grosse) punctulatis, verrucis (his a basi ad apicem continuis) elongatis cum aliis rotundatis instructis, interstitiis minus rugulosis, parte marginali lata a disco (per sulculum ante medium vix interruptum) divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali vix magis distanti; segmento ventrali basali (hoc rufo) sparsim subtilius punctulato; antennarum articulo 3° quam 4^{us} sat longiori. Long. $4\frac{1}{5}$-$4\frac{1}{2}$, lat. $3\frac{1}{5}$-$3\frac{1}{2}$ lines.

Femina quam mas paullo magis convexa.

This species is superficially very much like *P. serpiginosa*, Er., from which it differs *inter alia* by its larger size, evidently greater

convexity, more widely (though not more strongly) explanate sides of prothorax, different prothoracic markings, and especially by the extra-discal part of the elytra much wider and evidently sloping outward (in *serpiginosa* it is nearly vertical) with the humeral callus considerably more distant from the lateral margin of the elytra, as well as by the considerably longer third antennal joint (in *serpiginosa* this joint is scarcely longer than the fourth). If an example be looked at with the head directed towards the observer the mark on the observer's right resembles a comma (that on the left being of course reversed). The tails of the two marks are confluent in some examples. In *serpiginosa* the prothorax is usually without markings, but in some examples there are four more or less conspicuous blackish spots placed in a transverse row. This species is also very near *P. regularis*, Blackb., differing by its smaller size, evidently narrower form, less closely punctulate prothorax with different markings, &c.

Tasmania; sent by Mr. Simson from Launceston.

P. SYLVICOLA, sp.nov.

♀. Late ovalis; minus convexa, altitudine majori (a latere visa) contra vel paullo pone elytrorum medium posita; minus nitida; picea,[1] capite prothorace (hoc plus minusve piceo-adumbrato) elytrorum maculis nonnullis (his praesert. ad

(ad latera, vix ad apicem, magis rugulosis), parte marginali minus lata sed (parte submediana excepta) a disco per sulculum sat distinctum divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti; segmento ventrali basali minus sparsim minus subtiliter punctulato; antennarum articulo 3° quam 4^{us} sat longiori. Long. $4\frac{1}{4}$-$4\frac{3}{4}$, lat. 3-$3\frac{1}{2}$lines.

In general appearance much like *P. sordida*, but with the third int of the antennæ considerably longer, the elytral punctura-n stronger, the verrucæ more conspicuous (especially behind), e submarginal sulculus of the elytra strongly interrupted in ont of the middle, &c. Also resembles *P. punctata*, Marsh., it differs by sides of prothorax distinctly flattened, coarser incturation of elytra, narrower form, &c.

N. S. Wales; taken by Mr. Lea near Forest Reefs.

P. BALDIENSIS, sp.nov.

♂. Sat late ovata, modice convexa, altitudine majori (a latere visa) contra elytrorum marginem medium (vel etiam magis retro) posita; nitida; subtus picea hic illic rufescens; capite prothoraceque rufis, (nonnullorum exemplorum plus minusve infuscatis) elytris piceo rufoque incerte variegatis pedibus antennisque rufis, his apicem versus infuscatis; capite crebre subtilius punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, ab apice ad medium dilatato, pone apicem transversim minus distincte impresso, minus æquali, subtilius minus crebre (ad latera grosse rugulose) punctulato, lateribus sat æqualiter arcuatis late fortiter deplanatis, angulis posticis rotundatis; scutello fere lævi; elytris sub callum humeralem distincte depressis, pone basin transversim late fortiter impressis, sat grosse sat crebre subseriatim (ad latera paullo magis, postice multo minus fortiter) punctulatis, verrucis sat numerosis nitidis nigris sat inæqualibus in dimidia parte posteriori instructis, interstitiis (præsertim postice) rugulosis, parte marginali lata et sat late extrorsum directa a disco (per sulculum continuum) bene divisa, calli humeralis margine

are the conspicuous character of this species, whic
for the strong postbasal impressions of the elytra.
from Mt. Kosciusko in N. S. Wales are smalle
thorax a trifle more closely punctulate, but I do
distinct specifically. The intermediate verrucæ c
are fairly well defined.

Victoria; M. Baldi.

P. PUSTULOSA, sp.nov.

♀. Ovalis, minus convexa, altitudine majori (a
ante elytrorum marginem medium posita;
nigra, ferrugineo-variegata; capite prothora
transversim nigro 4-maculato; scutello obscu
seriatim verrucis magnis rotundatis (sed
nigris ornatis; antennis pedibusque obscu
versus rufis; capite subtiliter sat crebre p
thorace quam longiori plus quam duplo latio
1), ab apice paullo ultra medium dilatato, po
versim vix impresso, sparsius subtilius (ad l
punctulato, lateribus sat arcuatis sat ang
angulis posticis valde obtusis; scutello fe
fortiter subseriatim sat crebre punctulatis (la
spicue magis grosse), interstitiis (etiam ad
rugulosis, sub callum humeralem distincte
basin transversim late leviter impressis, pa

over the whole of its elytra, the largest of them scarcely smaller than the black spots on the prothorax.

Victoria.

P. MIXTA, sp.nov.

♀. Sat late ovata, sat convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; subnitida; nigra, capite prothoraceque rufis plus minusve nigro notatis, elytris nigro rufoque variegatis, antennarum basi rufa; capite crebre subaspere punctulato; prothorace quam longiori fere triplo latiori, ab apice fere ad basin dilatato, pone apicem transversim parum distincte impresso, confertim sat aspere minus subtiliter (ad latera magis grosse) punctulato, lateribus modice arcuatis anguste deplanatis, angulis posticis rotundatis; scutello punctulato; elytris sub callum humeralem fortiter depressis, pone basin transversim vix manifeste impressis, sat crebre sat fortiter subseriatim (ad latera magis, postice minus, fortiter) punctulatis, verrucis nigris numerosis sat distinctis subseriatim instructis, interstitiis rugulosis, parte marginali minus (apicem versus paullo magis) distincte a disco divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti; segmento ventrali basali sparsius sat subtiliter punctulato. Long. $3\frac{4}{5}$, lat. $2\frac{4}{5}$ lines.

Notable among its immediate allies by its very strongly transverse prothorax with close asperate even puncturation, the extremely strong depression of the elytra outside the humeral callus and the absence of any distinction between the discal and marginal parts of the elytra (except for a short distance near the apex).

Victoria; Alpine region.

P. SORDIDA, sp.nov.

Sat late ovata, minus convexa, altitudine majori (a latere visa) ad vel paullo pone elytrorum marginem medium posita; sat nitida; picea, hic illic (præsertim in capite et ad elytrorum prothoracisque latera) rufescens, antennarum basi rufa; capite

arcuatis vix deplanatis, angulis posticis obtu
lævi; elytris sub callum humeralem distinct
basin transversim vix impressis crebre sat for
(ad latera parum fortius, apicem versus mag
tulatis, verrucis nonnullis parvis minus di
instructis, interstitiis distincte (præsertim
rugulosis sed rugulis in disco puncturas hau
parte marginali sat angusta sed a disco (pe
tinuum) bene divisa, calli humeralis margine
quam ab elytrorum margine laterali multo
segmento ventrali basali sparsim subtiliter p

Mas quam femina paullo magis depressus, hujus
minus elongatis. Long. $4\text{-}4\frac{1}{5}$, lat. $3\text{-}3\frac{3}{10}$ line

The narrow lateral portion of the elytra divided
by a continuous furrow in combination with the
widest not much behind the middle, and the inco
verrucæ (concolorous with the derm) of the elytra
ing characteristic of this species among its near
female the greatest height of the elytra is a litt
than in the male.

S Australia; Mt. Lofty, &c.

P. foveata, sp.nov.

♀. Sat late ovalis (fere ovata), minus convexa,
(a latere visa) paullo pone elytrorum ma
posita; sat nitida; ut *P. sordida* colorata; c

tincte depressis, pone basin transversim sat fortiter impressis, sat crebre fortius subseriatim (ad latera magis grosse) punctulatis, verrucis nonnullis minus distinctis confuse instructis, interstitiis rugulosis (in partis impressæ subbasalis fundo opacis nec rugulosis), parte marginali minus lata a disco per sulculum sat distinctum (hoc ante medium et ad apicem summum interrupto) divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti; segmento ventrali basali sparsim fortius punctulato. Long. 4, lat. $2\frac{4}{5}$ lines.

Resembles *P. sordida* but is readily separated from it *inter ia* by the strongly marked subbasal impression on the elytral sc (which has somewhat the appearance of a subrotundate large allow fovea suggestive of, though very different from, the deep vea of *P. fossa* and *scabra*), and by the submarginal sulculus ing interrupted in front of its middle and not reaching the treme apex.

N.S. Wales; taken by Mr. Lea near Forest Reefs; also from ıverell.

P. MONTUOSA, sp.nov.

P. baldiensi affinis; quam hæc magis lata et multo magis convexa; elytris rufo-brunneis vix piceo-variegatis, pedibus obscuris; prothoracis disco magis crebre punctulato; elytris antice manifeste costatis, verrucis multo majoribus (cum superficie concoloribus) instructis, parte marginali minus fortiter extrorsum directa; abdomine magis crebre magis fortiter punctulato; cetera ut *P. baldiensis*. Long. $3\frac{3}{5}$, lat. 3 lines (vix).

Femina quam mas etiam multo magis convexa.

Rather closely allied to *P. baldiensis* structurally, though to a casual glance more suggestive of *P. rosea* and *P. impressa*, Chp. Its wider and very much more strongly convex form together with the very much larger and more elevated verrucæ of its elytra render it impossible to be confused with *baldiensis*. The greatest height of *P. baldiensis* is considerably less (of *P. montuosa* decidedly more) than half the length of the elytra. From *P.*

to run together into transverse ridges, especiall
declivity.

Victoria, Alpine region.

*P. ROSEA, sp.nov.

♀ Ovata, modice lata, altitudine majori (a late
elytrorum marginem medium (vel etiam mag
minus nitida; læte rosea, antennis apicem v
subtus plus minusve infuscatis; capite cr
punctulato; prothorace quam longiori ut 2½
apice sat longe ultra medium dilatato, pon
versim vix perspicue impresso, minus æqu
sat crebre (ad latera crebre grosse) punct
postice sat fortiter arcuatis late minus fort
angulis posticis nullis; scutello fere lævi
coriaceo; elytris sub callum humeralen
depressis, pone basin transversim fortiter imp
sat crebre subseriatim (postice minus gros
verrucis sat magnis inæqualibus (his hic i
subconjunctis) sat numerosis confuse instru
(præsertim transversim) inæqualiter rugulo
ginali modice lata a disco (per sulculum paul
anguste interruptum) bene divisa, calli hu
interno a sutura quam ab elytrorum margin
feste magis distanti; segmento ventrali
subfortiter punctulato. Long. 3⅔, lat. 2½ lin

ie elytra (tending to run together here and there into transverse lges on the laterally declivous portions) are suggestive of *P. ypressa*, Chp., from which, however, the present species differs ter alia by its much less convexity, its elytra at their highest ıch further from their base, and the much less strongly elevated rrucæ and ridges of the elytra. The intermediate verrucæ of e prothorax are fairly well-defined.

Victoria; Black Spur: also from the Blue Mountains (Mr. isters).

P. EXSUL, sp.nov.

♂. Late ovata, sat convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; sat nitida; picea, rufo-variegata (præsertim in capite fere toto, in prothoracis lateribus, in elytrorum marginibus et maculis indistinctis nonnullis, in antennarum basi, et in abdominis lateribus); capite crebre aspere punctulato; prothorace quam longiori ut fere $2\frac{3}{5}$ ad 1 latiori, ab apice ad medium dilatato, pone apicem transversim vix perspicue impresso, crebre minus subtiliter (ad latera sat grosse) punctulato, lateribus sat arcuatis distincte sat anguste deplanatis, angulis posticis obtusis; scutello subtiliter punctulato; elytris sub callum humeralem distincte depressis, pone basin subrotundatim impressis, crebre sat subtiliter subseriatim (ad latera paullo minus, postice paullo magis, subtiliter) punctulatis, verrucis nonnullis vix perspicuis subseriatim instructis, interstitiis leviter (apicem versus magis perspicue) rugulosis, parte marginali modice lata a disco (per sulculum ante medium late interruptum pone medium sat profundum) bene divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali paullo magis distanti; segmento ventrali basali sparsius subfortiter punctulato. Long. $3\frac{1}{5}$, lat. 3 lines.

Easily distinguishable among its near allies by the fine puncturation of its elytra (the verrucæ of which need looking for) in combination with the subquadrate prothorax (which is at its widest at the middle).

N.S. Wales; Richmond R. district, I believe.

piceescentibus; capite subtilius sat crebre v
lato; prothorace quam longiori ut 2¾ ad
sat longe ultra medium dilatato, pone ap
impresso, sat crebre subtilius haud rugul
grosse rugulose) punctulato, lateribus sat
guste deplanatis, angulis posticis fere nul
elytris sub callum humeralem depressis, p
versim leviter impressis, subtiliter (punct
subtilibus intermixtis, ad latera paullo mi
magis subtiliter) subseriatim punctulatis,
merosis (his minus elevatis) sparsim seriat
obsoletis) instructis, interstitiis haud (ap
manifeste) rugulosis, parte marginali ang
sulculum continuum) manifeste divisa, call
gine interno a sutura quam ab elytrorum
paullo magis distanti; segmento ventral
subfortiter punctulato. Long. 3¾, lat. 2⅘ l

This species bears a remarkable superficial re
castanea, Marsh., which however belongs to the
account of its different form. Besides the di
from *castanea* it is distinguished *inter alia* by the
more even puncturation, and much less widely e
its prothorax and by the well-marked depr
humeral calli.

N. S. Wales; near Sydney.

capite crebre rugulose punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, ab apice sat longe ultra medium dilatato, pone apicem transversim impresso, sat crebre subrugulose subtilius (ad latera paullo magis grosse) punctulato, lateribus sat arcuatis sat anguste deplanatis, angulis posticis fere nullis; scutello subtiliter ruguloso; elytris sub callum humeralem leviter depressis, pone basin rotundatim impressis, subtilius sat crebre subseriatim (ad latera vix magis, postice vix minus, fortiter) punctulatis, verrucis sat numerosis minus distinctis subseriatim instructis, interstitiis sat rugulosis, parte marginali a disco vix distincta, calli humeralis margine interno a sutura quam ab elytrorum margine laterali sat multo magis distanti; segmento ventrali basali sparsius subtilius punctulato. Long. $2\frac{1}{2}$, lat. $1\frac{4}{5}$ lines.

This is an inconspicuous species bearing much superficial resemblance to *P. foveata* and *sordida* from both of which it differs by its much smaller size and the considerably finer puncturation of its elytra. It also superficially resembles *P. mediocris*, *whittonensis* and *opacior* but differs from them *inter alia* by the very distinctly though narrowly explanate sides of its prothorax.

N. S. Wales.

P. MEDIOCRIS, sp.nov.

♂. Latissime ovata, modice convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; sat nitida; ut *P. exsul* colorata; capite crebre aspere punctulato; prothorace quam longiori fere triplo latiori, ab apice fere ad basin dilatato, pone apicem transversim impresso, sat crebre subfortiter (ad latera grosse) punctulato, lateribus leviter arcuatis haud deplanatis, angulis posticis nullis; scutello medio leviter punctulato; elytris sub callum humeralem manifeste depressis, pone basin transversim late distincte impressis, fortiter crebre subseriatim (ad latera paullo magis, postice paullo minus, fortiter), punctulatis, verrucis nonnullis modice distinctis nigris (his in lateribus transversim plus minusve confluentibus) instructis, interstitiis sat rugulosis (postice subgranuliformibus), parte marginali a disco (per

Notable among its immediate allies for its extr
and very strongly transverse prothorax. The h
more distant from the lateral margin than in most
allies.

N.S. Wales; Richmond R. district, I believe.

P. RUFICOLLIS, sp.nov.

Ovata, modice lata, modice convexa, altitudine
visa) contra elytrorum marginem medium (ve
posita; sat nitida; picea, capite prothorace
scutello elytris (horum verrucis parte su
margine summo, piceis) et corporis subtus pe
nonnullis rufis; capite crebre subtilius vix as
prothorace quam longiori ut $2\frac{3}{8}$ ad 1 latio
longe ultra medium dilatato, pone apicem
tincte impresso, minus fortiter sat crebre (
punctulato, lateribus sat arcuatis haud de
posticis fere nullis; scutello coriaceo vel fere
callum humeralem distincte depressis, pone h
impressis, crebre minus fortiter subseriatim
grosse) punctulatis, verrucis sat numeros
instructis, interstitiis minus rugulosis, pa
disco (per sulculum ante medium late inte
tincte divisa, calli humeralis margine intern
ab elytrorum margine laterali sat multo
segmento ventrali basali subfortiter minus cre

height of the elytra is a trifle nearer the front than in the female.

N.S. Wales; taken by Mr. Lea.

P. PROPRIA, sp.nov.

♂. Sat late ovata, sat convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; sat nitida; obscure rufo-castanea (ad latera fere sanguinea), corpore subtus antennisque plus minusve infuscatis; capite crebre sat fortiter punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, ab apice vix ultra medium dilatato, pone apicem transversim impresso, crebre sat fortiter (ut caput, sed ad latera grosse rugulose) punctulato, lateribus sat arcuatis haud deplanatis, angulis posticis distinctis obtusis; scutello crebre subtiliter punctulato; elytris sub callum humeralem distincte depressis, pone basin transversim leviter impressis, crebre fortiter subseriatim (ad latera paullo magis, postice minus, fortiter) punctulatis, verrucis nonnullis minus perspicuis (his cum superficie concoloribus) subseriatim instructis, interstitiis minus rugulosis, parte marginali sat lata a disco (per sulculum in medio sat late interruptum) sat distincte divisa, calli humeralis margine interno a sutura quam ab elytrorum margine distincte magis distanti; segmento ventrali basali sat crebre sat fortiter punctulato.

♀. Quam mas magis convexa. Long. $3\frac{3}{5}$-$3\frac{4}{5}$, lat. 3 lines.

Decidedly near *P. ruficollis*, but very distinct from it (apart from colour) *inter alia* by its prothorax at its widest *at* the middle.

South Australia, widely distributed; also Kangaroo Island.

P. WHITTONENSIS, sp. nov.

♂. Ovalis, minus convexa; altitudine majori (a latere visa) ad vel paullo pone elytrorum marginem medium posita; sat nitida; supra obscure rufa, capite antice piceo, prothorace nigro- vel piceo-notato, elytris plus minusve piceo-adumbratis et verrucis nigris variegatis; subtus picea plus minusve rufescens, pedibus concoloribus, antennis pallide rufis apicem versus infuscatis; capite crebre minus subtiliter vix rugulose

arcuatis haud deplanatis, angulis posticis o
punctulato; elytris sub callum humeralem le
pone basin vix impressis, sat crebre fortius
latera magis grosse) punctulatis, verrucis
seriatim instructis, interstitiis latera apicem
rugulosis (rugulis nonnullis transversis plus t
tis et continuis latera versus intermixtis),
ut *P. foveatæ*, calli humeralis margine intern
posito; segmento ventrali basali sparsim subt
Long. $3\frac{1}{5}$, lat. $2\frac{1}{8}$ lines.

Very much like *P. foveata* superficially, but d
inter alia by its considerably smaller size, the sides
not at all explanate, the much more numerous an
verrucæ of its elytra and the extreme faintness (
of the subbasal impression of the elytra. The t
losities of the elytra have a slight tendency t
continuous wheal-like ridge that forms a conspicu
some species of *Paropsis* (e.g., *transversalis*.)

N.S. Wales; taken by Mr. Lea near Whitton.

P. CRIBRATA, sp.nov.

P. propriæ simillima, differt corpore minus n
latera quam in disco vix magis rufis, horum
magis numerosis magis perspicue seriatis; pr
multo magis fortiter punctulato, elytris po
distincte impressis, his multo magis subtiliter

nct subbasal impression) there is no discal space notable coarseness of its puncturation. The whole punctura- :he elytra is manifestly finer. I have two examples of differing from *P. cribrata* in their smaller size and less s elytral verrucæ which, moreover, are concolorous with ı. I have little doubt that they represent a distinct e species, but I refrain from naming them without ; more specimens.

tralia; Yorke's Peninsula.

P. DECLIVIS, sp.nov.

late ovata; sat fortiter convexa, altitudine majori (a : visa) contra elytrorum marginem medium posita; s nitida; obscure rufa, antennis (basi excepta) corpore ıs pedibus capitis parte antica scutello et elytrorum cis piceis; *P. propriæ* affinis; differt prothorace ab apice feste ultra medium dilatato, pone apicem (hoc magis stato) haud impresso, angulis posticis magis rotundatis; llo sublævi; elytris paullo magis crebre magis subtiliter tulatis, pone basin haud impressis, verrucis vix elevatis s ut superficies punctulatis, parte marginali a disco haud ıcta; cetera ut *P. propria*. Long. 4, lat. $3\frac{1}{5}$ lines.

ıles *P. propria* and *P. cribrata* but differs from both by the marginal portion of its elytra (especially behind) s with the discal portion so that there is no longitudinal but the lateral and apical declivous parts descend quite thout being outturned at the margin. The puncturation ytra continuous over the verrucæ is also a notable and very rare in *Paropsis*.

Vales ; near Sydney.

P. TATEI, sp.nov.

lis, minus convexa, altitudine majori (a latere visa) ad ɔrum marginem medium posita; nitida; fere ut *P. pustu-* :olorata, sed antennis rufis apicem versus vix infuscatis ytrorum verrucis multo minoribus elongatis; capite

subtilius crebrius subrugulose punctulato; prothorace quam longiori ut $2\frac{2}{5}$ ad 1 latiori, antice fortiter angustato, ab apice longe pone medium dilatato, pone apicem transversim haud impresso, crebrius sat fortiter sat rugulose (ad latera valde rugulose) punctulato, lateribus modice arcuatis nullo modo deplanatis, angulis posticis valde obtusis; scutello lævi fortiter convexo; elytris subgrosse seriatim minus crebre punctulatis (ad latera etiam grossius, apicem versus multo magis crebre), interstitiis in disco haud (ad latera et versus apicem sat perspicue) rugulosis, sub callum humeralem distincte depressis, pone basin transversim late vix impressis, parte marginali a disco haud distincta, calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti, segmento ventrali basali sublævi. Long. $4\frac{1}{5}$, lat. 3 lines.

Rather closely resembling *P. pustulosa* superficially but readily distinguishable from it *inter alia* by its prothorax being not at all explanate laterally, much narrower in front and much more strongly and less smoothly punctulate; also by its elytra being evidently more coarsely and less closely punctulate, more regularly seriate, with much smaller and differently shaped verrucæ, and having their marginal part not distinct from the discal (in *pustulosa* there is an evident though very narrow lateral outturned portion especially noticeable near the apex). It should be noted that in this species the third antennal joint is slightly longer than the fourth, but too slightly to justify placing it among the species with the third joint "markedly" longer.

medium dilatato, pone apicem transversim distincte impresso, crebre aspere minus fortiter (ad latera grosse nec vel vix confluenter) punctulato, lateribus fortiter arcuatis nullo modo deplanatis, angulis posticis nullis; scutello sat opaco, dupliciter (sparsim fortius et confertim subtiliter) punctulato; elytris sat distincte sub callum humeralem depressis (et pone basin transversim impressis), crebre fortius subseriatim (ad latera multo magis grosse, postice magis crebre magis subtiliter) punctulatis, verrucis nonnullis parvis minus distinctis confuse instructis, interstitiis antice modice (postice crebre sat aspere) rugulosis, parte marginali sat angusta a disco (per sulculum antemedium anguste interruptum) bene divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali vix multo magis distanti; segmento ventrali basali sat sparsim subfortiter punctulato.

Mas quam femina nonnihil magis depressus, hujus antennis paullo minus elongatis. Long. $3\frac{1}{5}$-$4\frac{1}{5}$, lat. $2\frac{2}{5}$-$3\frac{1}{5}$ lines.

Resembles *P. sordida* superficially but differs from it by a multi-le of characters, conspicuous among which are its distinctly re convex form, more transverse differently shaped prothorax, tellum so closely punctulate as to be subopaque, and humeral lus distinctly more distant from the lateral margin of the tra.

Also near *punctata*, Marsh., but of considerably more depressed m.

S. Australia; on the hills near Adelaide, &c.; also Kangaroo and.

P. VICTORIÆ, sp nov.

♀. *P. alticolæ* simillima; subtus nigra, pedibus obscuris, prothorace paullo magis crebre punctulato; scutello fere lævi; elytris ad latera quam in disco vix magis fortiter punctulatis; calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti; cetera ut *P. alticola.* Long. $3\frac{4}{5}$, lat. $2\frac{4}{5}$ lines.

Another species very close to *P. alticola* but differing from it the evidently closer puncturation of its prothorax; the extremely

fine and sparse puncturation of its scutellum; a slight differen (mentioned above) in the elytral puncturation; and especially i the external (vertical) part of the elytral epipleuræ being le elevated, so that the humeral callus is nearer to the lateral margi of the elytra (being placed as in *P. sordida*). This latter characte *inter alia* forms a good distinction from *P. punctata*, Marsh. have not seen a male of this species. In the type the scutellu is very nitid, convex and scarcely punctulate; in a second exampl (possibly representing a distinct species) the scutellum is sul opaque, being very finely coriaceous, but both examples are devoi of the comparatively coarse punctures with which the scutellu is impressed in *P. alticola* and *punctata*, Marsh. In the "secor example" the elytral verrucæ are a trifle more conspicuous ar less tending to run together transversely.

Victoria.

P. SOLITARIA, sp.nov.

♀. Elongato-ovalis, modice convexa, altitudine majori (a late visa) paullo pone elytrorum marginem medium posita; s nitida; subtus nigra; capite prothoraceque brunneo-ru nigro-adumbratis; elytris piceis, verrucis numerosis seriati positis sordide testaceis et vittis concoloribus circiter ornatis, pedibus antennisque nigris, his basin versus sordi

4ᵘˢ vix longiori; epipleurarum parte externa (verticali) minime elevata. Long. 5, lat. $3\frac{1}{8}$ lines.

The most striking character in this species is the external (vertical) part of its elytral epipleuræ being very narrow [scarcely so wide as is the internal (horizontal) part where the latter is at its widest]. The colouring of the elytra in the unique type is also very remarkable, the derm being of a pitchy colour traversed by a number of dull testaceous vittæ on which are placed rather closely numerous concolorous verrucæ.

Victoria; Black Spur.

P. LIMA, sp.nov.

♀. *P. alticolæ* affinis sed magis convexa; pedibus antennisque (harum basi excepta) obscuris; elytris crebre granuloso-rugulosis. Long. 4, lat. $2\frac{9}{10}$ lines.

Another near ally of *P. alticola* but incapable of confusion with it on account of its much more convex form (at any rate in the female) and the strong close granule-like rugulosity of its elytral interstices which is so prominent as greatly to obscure the punctuation except in the subbasal impression. In the type this subbasal impression is almost circular, but I hesitate to attach much value to this character since the corresponding impression in *P. alticola* shows some approach (though less marked) to a similar form, the impression being subinterrupted in the middle so that its inner part (regarded separately) is scarcely transverse. From *P. punctata*, Marsh., it differs by its still more convex form, more nitid surface, and much more rugulose elytral interstices.

Victoria; sent to me by Mr. Billinghurst.

P. INVALIDA, sp.nov.

♀. Ovalis, parum convexa; altitudine majori (a latere visa) paullo pone elytrorum marginem medium posita; sat nitida; ut *P. sordida* colorata; capite minus crebre minus subtiliter punctulato, interstitiis valde distincte subtiliter punctulatis; prothorace fere ut *P. sordidæ* sed in disco sparsius sat leviter haud aspere (ad latera sat grosse sat crebre) punctulato,

(latera versus magis fortiter) punctula
modice distinctis seriatim instructis, in
(apicem versus magis rugulosis), parte m
(apicem versus subdistincto) distincto
margine interno a sutura quam ab elytror
haud multo magis distanti; segmento ver
subtilius punctulato. Long. $3\frac{3}{5}$, lat. $2\frac{3}{5}$ l

Also resembling *P. foveata* superficially, but
able from it and its other near allies *inter ali*
finer puncturation of its elytra, and by the
humeral callus being very little nearer to the
to the suture. Also resembles *P. seriata*, Ger
it *inter alia* by the presence of a depression
callus.

N.S. Wales; taken by Mr. Froggatt on the

P. TRANSVERSALIS, sp.nov.

Ovata, sat convexa, altitudine majori (a
elytrorum marginem medium (vel paullo
nitida; subtus rufa vel rufo-picea; capite
hoc plus minusve piceo adumbrato, elyt
gatis et nigro-verrucatis, antennis pedib
orum exemplorum magis obscuris); ca
punctulato; prothorace quam longiori u
apice ad vel paullo ultra medium dilatato

(his in parte impressa postbasali carentibus, et pone hanc partem ut ruga transversa fere a sutura ad marginem lateralem continua confluentibus), interstitiis vix rugulosis, parte marginali minus lata a disco (per sulculum ante medium late interruptum) divisa; calli humeralis margine interno a sutura quam ab elytrorum margine laterali sat multo magis distanti; segmento ventrali basali sparsim minus subtiliter punctulato. Femina quam mas magis convexa. Long. 3-3$\frac{1}{2}$, lat. 2$\frac{1}{5}$-2$\frac{3}{5}$ lines.

At once distinguishable from all its allies by the tendency of the elytral verrucæ to coalesce into coarse nitid ridges, the most conspicuous of which is placed at about the middle of the elytra and runs from near the suture almost to the lateral margin.

S. Australia; widely distributed.

TABULATION OF THE SPECIES FORMING SUBGROUP III.

*A. Elytra with a distinct postbasal impression on disc.
  B. Elytral margin (viewed from the side) straight or but little sinuous.
    C. Elytral puncturation (and especially its seriation) much obscured by irregular transverse rugulosity.
      D. Elytra not marked with a common dark blotch behind the scutellum.
        E. Elytral verrucæ of hind declivity all closely placed in rows.................... granaria, Chp.
        EE. Elytral verrucæ of hind declivity sparse and confused.
          F. Inner edge of humeral calli evidently nearer to lateral margin than to suture.. rugulosior, Blackb.
          FF. Inner edge of humeral calli equidistant between lateral margin and suture.................................... morosa, Blackb
      DD. Elytra with a conspicuous common dark blotch behind scutellum.................... stigma, Blackb.
    CC. Elytral interstices not, or but very feebly, rugulose, not obscuring the punctures.

* The impression is less marked in *granaria*, Chp., than in its allies

D. Prothorax strongly rugulose, even more so than in *P. serpiginosa*. .. .. Sloan

DD. Prothorax not, or but little, rugulose.

E. Depressed species, upper outline (viewed from side) more or less straight, humeral callus exceptionally near lateral margin.

F. Elytral margin (viewed from side) distinctly though not strongly sinuous; form wide..... .... gross

FF. Elytral margin (viewed from side) straight; form notably less wide. . seriat

*EE. Species of more convex form; upper outline (viewed from side) a continuous curve

F. Prothorax closely punctulate.

G. Prothorax with black markings.

H. Underside testaceous (here and there infuscate) . ... inter

HH. Underside black. .... tinct.

GG. Prothorax without markings (size small, scarcely 3 lines). .. .. male

FF. Prothorax sparsely punctulate...... . Leai.

BB. Elytral margin (viewed from the side) strongly sinuous.

C. Elytra furnished with strongly defined interrupted costæ . . . . *costi*

CC. Elytra without costæ strig

DD. Seriate arrangement of elytral verrucæ and especially the punctures scarcely evident.

E. Elytra exceptionally finely punctulate.

F. Form exceptionally wide, elytra by measurement wider than long......... alta, Blackb.

FF. Form notably less wide, elytra longer than wide...................... .... inornata, Blackb.

EE. Elytra much more coarsely punctulate inæqualis, Blackb.

CC. Puncturation of prothorax very coarse.

D. Inner edge of humeral calli much nearer to lateral margin of elytra than to suture alpina, Blackb.

DD. Inner edge of humeral calli equidistant between lateral margin of elytra and suture.. *asperula*, Chp.

CCC. Puncturation of prothorax very sparse and fine....................................... .. .. borealis, Blackb.

BB. Elytral verrucæ conspicuously paler in colour than the general surface

C. Form oval and depressed.......................... notabilis, Blackb.

CC. Form subcircular and strongly convex....... vomica, Blackb.

P. RUGULOSIOR, sp.nov.

♂. Latissime subovalis, subcircularis; modice convexa, altitudine majori (a latere visa) contra elytrorum marginem medium (vel paullo magis antice) posita; sat nitida; ferruginea, corpore subtus pedibus elytrisque plus minusve fusco-adumbratis, horum verrucis piceis; capite crebre subaspere punctulato; prothorace quam longiori ut $2\frac{2}{3}$ ad 1 latiori; ab apice longe ultra medium dilatato, pone apicem transversim leviter impresso, crebrius subfortiter subrugulose (ad latera grosse rugulose) punctulato, lateribus modice arcuatis haud deplanatis, angulis posticis nullis; scutello nitido vix punctulato; elytris sub callum humeralem haud depressis, pone basin transversim impressis, crebre minus fortiter subseriatim (ad latera multo magis grosse, postice magis subtiliter) punctulatis, verrucis modice magnis sat numerosis confuse instructis, interstitiis (parte subbasali impressa excepta) confertim granuloso-ruguloso (præsertim apicem versus), parte

marginali a disco vix distincta, calli hume interno a sutura quam ab elytrorum margine magis distanti: segmento ventrali basali punct $2\frac{4}{5}$, lat. $2\frac{2}{3}$ lines.

An inconspicuous species chiefly notable for i almost entire absence of distinction between the di ginal parts of the elytra and fine close but not str granulosity of the interstices of the elytral puncti that the rugulosity of the elytra (especially behind spicuous than the puncturation.

S. Australia; Adelaide district.

P. MOROSA, sp.nov.

P. rugulosiori affinis; valde convexa; colore n nonnullorum exemplorum prothorace nigro-m thorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, i subtiliter magis æqualiter nullo modo rugulo elytris subtiliter punctulatis, magis crebre rugulosis, ad latera quam in disco vix magis g ratis, calli humeralis margine interno a sut elytrorum margine laterali haud magis dista *P. rugulosior*. Long. $3\frac{1}{2}$, lat. 3 lines.

Femina [illegible] mas etiam magis convexa

posita; sat nitida; ferruginea, prothoracis maculis nonnullis elytrorum maculis nonnullis (præsertim macula sat magna communi antemediana) et corporis subtus partibus nonnullis piceis; capite crebre subtilius punctulato; prothorace quam longiori ut $2\frac{2}{3}$ ad 1 latiori, ab apice longe ultra medium dilatato, pone apicem transversim impresso, sat crebre minus fortiter (ad latera grosse rugulose) punctulato, lateribus sat fortiter arcuatis nullo modo deplanatis, angulis posticis nullis; scutello fere lævi; elytris sub callum humeralem haud depressis, pone basin transversim leviter impressis, sat crebre sat fortiter vix seriatim (ad latera multo magis grosse) punctulatis, verrucis minus numerosis minus ordinatim instructis, interstitiis sat fortiter (præsertim transversim) rugulosis, parte marginali sat lata a disco minus (prope apicem magis perspicue) distincto; segmento ventrali basali subfortiter punctulato. Long. $2\frac{4}{5}$, lat. $2\frac{1}{5}$ lines.

Feminæ quam maris altitudine majori paullo magis postice posita.

The dark markings on the prothorax of the type consist of several small ill-defined blotches which in some examples coalesce into a large and better defined blotch on each side. In the type the common blotch on the elytra is accompanied by several small spots in the basal region, but in some examples it is the only dark mark except the verrucæ; I have not seen any example of the species in which the common elytral blotch is altogether wanting. In some examples the verrucæ are scarcely darker than the derm.

Victoria; N.S.W.; S. Australia.

P. Sloanei, sp.nov.

♀. Ovata minus lata, minus convexa, altitudine majori pone elytrorum marginem medium posita; sat nitida; testacea, corpore subtus piceo-vario, prothorace elytrisque tortuose nigro-notatis, horum verrucis nigris; capite fortius subrugulose punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, ab apice ultra medium dilatato, pone apicem transversim impresso, fortiter (ad latera grosse) rugulose punctulato,

lateribus sat arcuatis nullo modo deplanatis, angulis posticis nullis; scutello punctulato; elytris sub callum humeralem haud depressis, pone basin parum perspicue impressis, sat crebre subgrosse subseriatim (postice minus grosse) punctulatis, verrucis numerosis sat æqualiter seriatim instructis, interstitiis vix (postice magis perspicue) rugulosis, parte marginali a disco vix distincta, calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti; segmento ventrali basali sparsim subtiliter punctulato. Long. 4, lat. $2\frac{1}{3}$ lines.

A conspicuous species, notable for the sharply defined contrast between the testaceous derm and the intricate sinuous black markings and verrucæ of its upper surface, also for the strong but somewhat fine rugulosity of the disc of its prothorax, the coarse puncturation of its elytra, &c.

N.S. Wales; sent to me by Mr. Sloane.

P. GROSSA, sp.nov.

♀. Ovata, sat depressa, modice nitida; ferruginea, corpore subtus pedibus prothorace elytrisque plus minusve piceo-adumbratis; capite subtilius sat crebre punctulato; prothorace quam longiori ut $2\frac{1}{2}$ ad 1 latiori, ab apice ultra medium dilatato, pone apicem transversim impresso, dupliciter (sc. subtiliter et magis fortiter), ad latera grosse rugulose, minus crebre punctulato, lateribus modice arcuatis nullo modo deplanatis, angulis posticis rotundatis; scutello punctulato; elytris sub callum humeralem haud depressis, pone basin

absence of any depression below the humeral callus, as well as by its more depressed form, differently sculptured prothorax, &c.

N.S. Wales; Tweed River district.

P. INTERIORIS, sp.nov.

♀. Subovata; modice convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; rufo-ferruginea, prothoracis maculis nonnullis et elytrorum maculis nonnullis verrucisque nigro-piceis; capite crebre minus fortiter punctulato; prothorace quam longiori ut $2\frac{4}{7}$ ad 1 latiori, ab apice fere ad basin dilatato, pone apicem transversim impresso, sat crebre subaspere (ad latera grosse rugulose) punctulato, lateribus minus arcuatis nullo modo deplanatis, angulis posticis rotundatis; scutello fere ut prothorax punctulato sed minus crebre; elytris sub callum humeralem haud depressis, pone basin transversim impressis, crebre fortiter subseriatim (ad latera magis, postice minus, fortiter) punctulatis, verrucis sat numerosis (per totam superficiem, parte postbasali impressa excepta, distributis) seriatim instructis, interstitiis antice vix (postice manifeste) rugulosis, parte marginali a disco vix distincta, margine ipso angusto manifeste extrorsum inclinato, calli humeralis margine interno a sutura quam ab elytrorum margine laterali multo magis distanti; segmento ventrali basali sparsim subtilius punctulato. Long. $4\frac{1}{5}$, lat. $3\frac{1}{2}$ lines.

A species without any very strongly marked structural characters, a little less markedly convex, moreover, than the other species with which I have associated it. The presence of about four ill-defined blackish marks on the prothorax and the regular seriation of the elytral verrucæ together with the blackish stains on the elytra, especially about the middle of the suture, are superficial characters (probably not very variable) by which the species may be somewhat easily recognised among its near allies. It is not unlike *P. funerea*, Blackb., which, however, is very easily recognised by the great width of its prosternal ridge.

Central Australia.

visa) contra elytrorum marginem medium
testacea, corpore subtus prothoracis mac
positis sat parvis elytrorum verrucis sat ma
sat numerosis nigris, antennis apicem versu
capite crebre subtilius punctulato; prothor
ut fere 3 ad 1 latiori, ab apice ultra medi
minus angustato pone apicem transversim
crebre minus fortiter (ad latera grosse ru
lateribus sat fortiter arcuatis nullo modo
posticis rotundatis; scutello vix punct
callum humeralem haud depressis, pone
impressis, sat crebre fortiter subseriatim
magis grosse) punctulatis, verrucis sat
instructis, interstitiis (nisi ad latera) vi
marginali a disco minus distincta, calli
interno a sutura quam ab elytrorum marg
magis distanti; segmento ventrali bas
fortiter punctulato. Long. $3\frac{1}{2}$, lat. $2\frac{3}{5}$ lin

Resembles *P. granaria*, Chp., in colour and
surface, but differs by its black underside (the
testaceous), considerably wider prothorax muc
front, discal interstices of elytra scarcely at
close to the apex, &c.

W. Australia; taken by E. Meyrick, Esq.

P. MALEVOLA, sp.nov.

A species quite capable of being confused with several others, especially *P. rugulosior* and *P. stigma*. From both these it may be at once distinguished by the evidently more conspicuous and regularly seriate puncturation of its elytra, from the former also by its much narrower form and strongly rugulose scutellum, and from the latter also by its rugulose scutellum and the entire absence of any blackish patch on the sutural region.

S. Australia, near Adelaide.

P. LEAI, sp.nov.

♂. Ovata; modice lata; sat convexa, altitudine majori (a latere visa) contra vel fere ante elytrorum marginem medium posita; sat nitida; subtus piceo- rufoque-variegata; supra testaceo-brunnea, prothoracis maculis 4 parvis (his transversim in disco dispositis) et elytrorum verrucis obscuris, antennis rufis apicem versus piceis, pedibus piceis plus minusve rufo-variegatis; capite crebrius minus subtiliter punctulato; prothorace quam longiori ut $2\frac{2}{3}$ ad 1 latiori, ab apice sat longe ultra medium dilatato, pone apicem transversim leviter impresso, subtilius sat sparsim (ad latera grossius nec confluenter) punctulato, lateribus sat arcuatis nullo modo deplanatis, angulis posticis rotundatis; scutello sparsissime punctulato; elytris sub callum humeralem haud depressis, pone basin transversim impressis, fortius minus crebre subseriatim (ad latera vix magis, postice vix minus, fortiter) punctulatis, verrucis parvis sat numerosis sat regulariter seriatim instructis, interstitiis haud rugulosis, parte marginali sat lata a disco vix perspicue (apicem versus magis distincte) divisa, calli humeralis margine interno a sutura quam ab elytrorum margine laterali sat multo magis distanti; segmento ventrali basali sparsim subtiliter punctulato. Long. $3\frac{1}{2}$, lat. $2\frac{1}{2}$ lines.

This species is rather closely allied to *P. interioris*, which it greatly resembles in markings and colour except in the underside being much darker and the patches of dark colour on the elytra

P. STRIGOSA, Chp.

I have an example named as this species collection, and there is also before me an exa Mr. Lea which I cannot distinguish from it. "Parao River," Mr. Lea's "Swan River." It sible that the species is found in these two ver but I think it more probable either that Dr. wrong, or my example is not really conspecific represents a closely allied species.

P. MACULICEPS, sp.nov.

♀. Subovata, modice lata; sat convexa, al latere visa) contra elytrorum marginen minus nitida; obscure ferruginea; capit apicem versus, nonnullorum exemplorum (in his) verrucis, pedibus plus minusve exemplorum sternis, piceis; capite sat punctulato; prothorace quam longiori ut apice longe ultra medium dilatato, pone a impresso, sat crebre subfortiter sat rugulos punctulato, lateribus sat fortiter arcuatis atis, angulis posticis rotundatis; scutello elytris sub callum humeralem haud dep transversim haud impressis, subfortiter sub

Among its allies structurally (having no subbasal elytral ›pression) this species is superficially distinct by its subseriate ›tral puncturation together with the almost regular rows of all rather closely placed verrucæ, which are concolorous with derm. There is, however, a tendency to the elytra being ›ked with dark vittæ (which in some examples are very well-›ned), and on these vittæ the verrucæ are concolorous with ›n and not with the general surface.

. Australia, Yorke's Peninsula.

P. PUSTULIFERA, sp.nov.

'. *alticolæ* affinis; differt colore toto (prothoracis maculis nonnullis, et elytrorum verrucis, nigris exceptis) testaceo-castaneo; prothorace in disco magis fortiter minus crebre (ad latera grosse confluenter) punctulato; scutello nitido sparsim fortiter punctulato; elytris in disco magis fortiter punctulatis, verrucis valde perspicuis (haud transversim elongatis) in seriebus integris circiter 9 sat crebre sat regulariter dispositis; cetera ut *P. alticola*.

'emina quam mas paullo magis convexa. Long. 4, lat. $2\frac{1}{5}$ lines.

ılthough superficially very different from *P. alticola*, this ›ies is structurally very close to it. The notably coarser punc›tion of its upper surface, however, forms a reliable distinction, the colour and markings are so different that it is unlikely varieties approximate much to *alticola*. With the exception ›ome black marks on the prothorax (a longitudinal blotch on ›er side of the middle and a few small spots nearer the margins, ›he type) and numerous small round black verrucæ (about 15 › series) placed in about 9 series very evenly over the whole ›ra, the entire insect is of a uniform pale chestnut colour. ›re is, in the type, also a common dark blotch on and around suture a little in front of its middle, apparently caused by the ›rvals between two or three verrucæ being stained with dark ›uring similar to that of the verrucæ.

I. W. Australia; sent to me by Mr. Froggatt.

nitida; castaneo-brunnea, antennis apicem
parte et corpore subtus piceis; capite sa
punctulato; prothorace quam longiori ut 2
apice sat longe ultra medium dilatato, p
versim leviter impresso, crebre subfortiter a
(parte laterali sat grosse rugulosa exc
lateribus sat fortiter arcuatis nullo modo d
posticis nullis; scutello ut prothorax punct
callum humeralem haud depressis, pone
haud impressis, confertim dupliciter (subtil
tiliter) sat aspere vix subseriatim (latera v
postice vix minus, fortiter) punctulatis
nonnullis parum perspicuis instructis, inter
losis, parte marginali a disco vix distinct
margine interno a sutura quam ab elytroru
paullo magis distanti; segmento ventrali
vix crebre punctulato; antennarum arti
distincte longiori. Long. $3\frac{1}{2}$, lat. 3 lines.

A somewhat isolated species on account of
its great convexity the species of the next sub
ing from them by the greatest height of the ely
back. On careful examination it is seen that t
antennæ is distinctly longer than the 4th, bu
length is not marked enough to associate
P. regularis and its allies, and its natural place
P. inornata, Blackb.

transversim vix penitus æquali; antennarum articulo 3° quam 4ⁱ haud longiori; cetera ut *P. alta*. Long. 4, lat. $3\frac{1}{3}$ lines.

♀. Quam mas subconvexiori.

Except in respect of a few well-marked characters this species is so close to *P. alta* that it seems unnecessary to repeat the whole of the description of the latter which (modified by the characters noted above) applies exactly to this insect. The much less convexity and the antennal difference at once separate *P. inornata*, as also the absence of puncturation on the scutellum, but this latter character I do not so absolutely rely upon, as I find that there is a slight tendency to variation in the puncturation of the scutellum of many species of *Paropsis*. I do not think, however, that any specimen of *P. inornata* would have anything like the strong scutellar puncturation of *P. alta*, which is quite continuous with the puncturation of the prothorax. Indeed, I have before me some examples of *Paropsis* from Yorke's Peninsula and from Eucla which I believe to be *P. inornata*, in which the scutellum bears some fine punctures. It is possible that they represent a distinct very close species, but the point could not be certainly decided without the examination of more examples from the same locality as the type of *P. inornata*, from which locality I have seen only one female, and that one is in bad condition.

W. Australia; Eyre's Sand Patch.

P. INÆQUALIS, sp.nov.

♂. Late ovata; minus convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; modice nitida; nigra, antennarum basi et pedibus maculatim (tarsis totis) rufis; capite prothoraceque æqualiter (sed hoc ad latera grosse rugulose) crebre subfortiter fere rugulose punctulatis; hoc quam longiori ut $2\frac{2}{5}$ ad 1 latiori, ab apice ultra medium dilatato, pone apicem transversim leviter impresso, lateribus fortiter arcuatis nullo modo deplanatis, angulis posticis nullis; scutello (exempli typici carente); elytris sub callum humeralem haud depressis, pone basin transversim haud impressis,

paullo magis distincte) divisa; segmento v
fortiter subcrebre punctulato. Long. $3\frac{1}{2}$,

A fairly distinct species notable for its bla
coarse puncturation of its elytra, the verrucæ c
what large and numerous but not strongly ele
margin of the prosternum is exceptionally wide

S. Australia; Adelaide district.

P. ALPINA, sp.nov.

♀. Ovata, sat fortiter convexa, altitudine ma
ad elytrorum marginem medium posita;
flavo-brunnea, elytris (parte basali median
antica exceptis) nigro-adumbratis et confu
antennis apicem versus vix infuscatis; capi
sat rugulose punctulato; prothorace quam
duplo (ut $2\frac{1}{2}$ ad 1) latiori, ab apice lon
dilatato, pone apicem haud transversim i
rugulose (ad latera etiam magis grosse) pu
sat arcuatis haud deplanatis, angulis posti
lævi; elytris dupliciter (grosse et minus
subseriatim punctulatis, antice haud (post
verrucosis, interstitiis antice vix (ad lat
grosse, postice crebre sat granulatim) rug
humeralem leviter depressis, parte marg
distincta, calli humeralis margine interno

an ill-defined festoon-like patch of blackish colour a little behind the base (its extremities on the humeral calli), behind which the whole surface (except the front half of the marginal portion) is thickly set with blackish irrorations very various in size. Genuine verrucæ are almost non-existent except near the apex, and even there they are so much mixed with confused rugulosity as to need being looked for.

Victoria; on the higher Alps.

P. BOREALIS, sp.nov.

Subovata; sat fortiter convexa, altitudine majori (a latere visa) contra elytrorum marginem medium posita; nitida; rufa, prothoracis marginibus scutello elytrorum macula communi antemediana et utrinque macula prope humerum posita corporeque subtus (hoc maculatim) indeterminate piceis; capite sparsim subfortiter punctulato; prothorace quam longiori ut $2\frac{1}{4}$ ad 1 latiori, ab apice vix ultra medium dilatato, pone apicem transversim haud impresso, sparsim inæqualiter subacervatim (ad latera sat grosse sat crebre nec confluenter) punctulato, lateribus minus fortiter arcuatis haud deplanatis, angulis posticis rotundatis; scutello punctulato; elytris sub callum humeralem haud depressis, pone basin nullo modo impressis, minus fortiter sat crebre sat æqualiter (antice suturam versus magis subtiliter) subseriatim punctulatis, verrucis nonnullis parvis subseriatim dispositis instructis, interstitiis vix rugulosis, parte marginali a disco haud distincta, calli humeralis margine interno a sutura quam ab elytrorum margine laterali paullo magis distanti; segmento ventrali basali sparsim obsolete punctulato. Long. 4, lat. $2\frac{4}{5}$ lines.

As the type has lost its tarsi, I am not sure of its sex, but have ttle doubt of its being a female. The entire absence of any ace of a subbasal elytral impression and the evenness of the ytral puncturation are well-marked characters. The inconicuous verrucæ are concolorous with the derm and run in fairly

N. Territory of S. Australia; taken by the lat

P. NOTABILIS, sp.nov.

♂. Ovalis; minus convexa, altitudine majori contra elytrorum marginem medium posita; brunnea, maculis in capite prothoraceque (verrucis exceptis) antennis apicem versus (hoc maculatim) obscurioribus; capite s punctulato; prothorace quam longiori fere u latitudine majori fere ad basin posita, anti angustato, pone apicem haud impresso, f haud crebre (ad latera sat grosse nec cr lateribus leviter arcuatis haud deplanatis, obtusis; scutello lævi; elytris sub callum depressis, pone basin nullo modo impressis, (ad latera parum magis fortiter) punc numerosis magnis parum elevatis instructis, rugulosis, parte marginali angusta a disco (distinctum) pone medium divisa, calli hu interno a sutura quam ab elytrorum margi magis distanti; segmento ventrali basal punctulato. Long. 6, lat. $4\frac{1}{3}$ lines.

A remarkable species, with considerable superf to *P. solitaria*, Blackb., but differing from it much larger size and elytra not depressed be

P. VOMICA, sp.nov.

♂. Latissime ovata; fortiter convexa, altitudine majori (a latere visa) anterius quam contra elytrorum marginem medium posita; sat nitida; rufo-brunnea, elytrorum verrucis testaceis vel flavescentibus, corpore subtus in majori parte picescenti; capite sat crebre aspere punctulato; prothorace quam longiori ut $2\frac{2}{5}$ ad 1 latiori, ab apice paullo ultra medium dilatato, pone apicem transversim vix impresso, sat crebre dupliciter (subtiliter et sat fortiter, ad latera grosse) punctulato, lateribus sat arcuatis late distincte deplanatis, angulis posticis rotundatis; scutello fere lævi; elytris sub callum humeralem haud depressis, pone basin haud impressis, subtilius vix seriatim (ad latera vix magis grosse) punctulatis, verrucis magnis (minus fortiter elevatis) numerosis seriatim instructis, interstitiis paullo rugulosis, parte marginali a disco (nisi apicem versus) minus distincta, calli humeralis margine interno a sutura quam ab elytrorum margine laterali paullo magis distanti; segmento ventrali basali sublævi; antennarum articulo 3° quam 4^{us} sat longiori.

♀. Quam mas paullo minus lata, segmento ventrali apicali magis perspicue punctulato. Long. 4-$4\frac{1}{3}$, lat. $3\frac{1}{2}$ lines.

An extremely distinct species, on account of the large moder-ely elevated verrucæ of the elytra conspicuously more pallid an the general surface and very evenly distributed except on a all roundish common antemedian space. Its strongly convex rm suggests alliance with the species of the next subgroup, but e greatest height of its elytra is very little in front of the ddle. It seems to be somewhat uncertain in position in the ius, the slightness of the tendency to seriate arrangement in punctures of its elytra being suggestive of species with the nt angles of the prothorax mucronate.

Ṽ. W. Australia; sent to me by Mr. Masters.

THE SILURIAN TRILOBITES OF NEW SOUTH WITH REFERENCES TO THOSE OF OTI PARTS OF AUSTRALIA.

By R. Etheridge, Junr., Curator of the Australia —and John Mitchell, Public School, Narei

Part IV.

The ODONTOPLEURIDÆ.

(Plates l.-lv.)

The next family we propose to take up is that of t pleuridæ, adopting this name in preference to Acidaspic we have every reason to believe it to have precedence. used the term in 1843, but we have not been able to a how early a date Barrande employed that of Acidas which Zittel credits him. It could, however, hardly before the date in question. The genera, or sections genus, *Acidaspis*, whichever the idiosyncrasy of the r choose to regard them, are the following :—

Ceratocephala, Warder, 1838.

The study of this group has proved an arduous one from the complex nature of the cephalic shield or cephalon, and we may have erred by introducing too much detail; this is, however, an error on the right side.

"Of all the extravagant forms of this curious family of Trilobites," says Salter,* "none seem so extravagant in its ornament as the genus *Acidaspis;* the head, thorax, and tail being literally crowded with spines wherever an available angle occurs."

Genus ODONTOPLEURA, Emmrich, 1839.

Odontopleura, Emmrich, De Trilobitis, 1839, p. 35.
" Burmeister, Organization of Trilobites (Ray Soc.), 1846, p. 61.
" Clarke, 10th Ann. Report State Geol. N. York for 1890 (1891), p. 67.

Obs.—This genus is distinguished from other Acidaspids by having the occipital ring either with or without a tubercle in the centre, but totally devoid of a spine or spines. The type, according to Mr. J. M. Clarke, is *O. ovata*, Emmrich, a form having some characters in common with our first species, but in others departing widely from it.

The specific history of the Acidaspidæ in Australia is a brief one. As recorded by Mr. F. Ratte,† Mr. Chas. Jenkins, L.S., appears to have been the first to recognise the presence of the genus in our rocks. He figured the greater portion of a Trilobite that he referred to *Acidaspis Brightii*, Murchison,‡ from Yass, but during our researches we cannot say that we have met with any Trilobite that would strictly agree with that species; indeed we have not seen a true *Acidaspis*, as now restricted, from Australia. Mr. Jenkins was followed by the late Mr. Felix Ratte, who contributed two papers to the Proceedings of this Society

* Brit. Org. Remains, Dec. vii., Pt. 6, p. 2.
† Proc. Linn. Soc. N.S. Wales, 1887, ii. (2), p. 99 (footnote).
‡ Proc. Linn. Soc. N.S. Wales, 1879, iii., Pl. 17, f. 5.

dealing with Acidaspids from Bowning. In the first h
species ascribed by him to the following well-known Tri

A. Verneuili, Barr., or *A. vesiculosa*, Ba
Acidaspis near *A. Prevosti*, Barr.
Acidaspis near *A. mira*, Barr.

In the second paper† the following :—

Acidaspis near *A. Dormitzeri*, Corda.
Acidaspis near *A. Leonhardi*, Barr.

At a later period one of us‡ described a new species, Bowning, as *A. longispinis*. The whole of these will in review in the present paper.

We now recognise the following four species :—

Odontopleura bowningensis, nobis.
" *Rattei*, nobis.
" *parvissima*, nobis.
" *Jenkinsi*, nobis.

ODONTOPLEURA BOWNINGENSIS, *sp.nov.*

(Pl. L., figs. 1-3; Pl. LII., fig. 5.)

Sp. Char. *Body*—Ovoid. *Cephalic shield or cephalon* tical, about three times as wide as long measured be

triangular, very tumid, granulated; ocular bands or ridges row and partly overhung by the genal lobes, and themselves overhanging the free cheeks and bearing a distinct row of ; genal or palpebral furrows distinct; eyelobes small, r areas very small. Free cheeks of tolerable proportionate nsely tumid, borders intensely thickened, particularly the genal angles, each bearing twelve short, acicular, spines exclusive of the genal spines, marginal furrow nct. Genal spines short, stout, falcate, and forming gles with the cephalon. Facial sutures anteriorly appear ered, but their course is indicated along and under the ges, and they incline towards each other at an angle of ng the front margin in a line with the axial furrows; y they run obliquely to the median point of the lateral s of the fixed cheeks, thence parallel with those extenthe genal angles. Occipital furrow wide and shallow but deep at the sides, continuing across the sides disd joining the marginal furrows of the free cheeks. Neck al ring strongly arched vertically, only moderately so s, sides nodular, no central tubercle. Eyes prominent, s the highest part of the central glabella lobe, small, apart, the distance between them being equal to twice 1 of the cephalon.

.—Consists of ten segments, width equal to the combined itself and pygidium, granulated. Axis prominent, der than the pleuræ, posterior width half of the anterior

arched anterior ring and a terminal piece v
circumfurrowed, and centrally depressed. Tl
divided into two pairs of pleuræ by one pair c
tending from the axis ring; they are flat, tuber
border much thicker and internally bounded
Tail spines fourteen, acicular, four intermedi
side of the axial pleural spines, the latter di
length from the axial pair outwards, so that
pairs are very short.

Obs.—The striking features of this species
proportionate width, particularly of the cepha
spines and short, jutting, obtuse hornlike g
very small eyes; (4) the absence of an occipi
great width between the eyes and their near
margin of the cephalon; and (6) the excess
cephalon as a whole.

Whilst resembling *O. ovata*, Burmeister,*
the great proportionate breadth of the bo
form departs very markedly in possessing t
thoracic segments, in the very small pygic
number of spines around the margin of th
shorter and stouter genal spines. Similar ch
from *O. elliptica*, Burmeister.† From an alli
O. crossota (Locke), Meek,‡ our species is se
shape, and segmentation of the pygidium.

From the American Devonian species *O. callicera*, Hall,* our species is equally distinct. It lacks the long genal spines and large eyes of the former and possesses a greater number of cheek spines.

It is with the Bohemian species that the Bowning Trilobite seems to correspond best, although it is a broader form than the majority of the former, if not indeed of all those allied to it.

In *O. Leonhardi*, Barr., the pleuræ are single-spined, in our form double, and the pygidium spines are increased in number and are constant. In the former the genal spines are long and acicular, in the latter short and stout, and the courses of the facial sutures are different in the two species.

From *O. minuta*, Barr., *O. bowningensis* is at one distinguished by the uniformity of the spines extending from the pygidium of the former, and again by the nature of the pleural and genal spines. It may be said also that the same characters separate our form from *O. Dormitzeri*, Barr., and *O. Roemeri*, Barr. In the latter the backward extension of the genal spine is enormous.

The description is taken from decorticated specimens.

Loc. and Horizon —Bowning Creek, near Bowning, Co. Harden, Lower Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

ODONTOPLEURA RATTEI, *sp. nov.*

(Pl. L., fig. 7; Pl. LI., figs. 8-9; Pl. LII., figs. 1-4; Pl. LIII., figs. 1-3.)

Acidaspsis near *A. Leonhardi*, Ratte (non Barr.), Proc. Linn. Soc. N.S. Wales, 1887, ii. Pt. 2, p. 99, Pl. 2, figs. 2-4.

Sp. Char.—*Body*—oval. *Cephalic shield or cephalon*—Subsemicircular, a little wider than twice the length, and straight in front. Glabella quadrate, width between eye lobes equals length, including the neck ring, distinctly and evenly granulate, front margin dentate; central portion suboblong, intensely arched transversely, moderately so from front to back, highest medially

* Pal. N. York, 1888, vii. t. 16*b*, f. 1-13.

and bending rapidly to and merging into the front margin, e expanded in front; the first pair of lateral lobes in mentary form (tubercles merely); lateral portions di bilobed, median pair suboval, very tumid, about half the the posterior pair, and very distinctly separated by the furrows which join the axial and false axial furrows; fal furrows very distinct, particularly at their junctions wi lateral furrows, passing into the neck furrow; axial furr tinct and intensely so as they join the neck furrow, faint the posterior margins. Fixed cheeks suboblong, tumid lobes ridged; ocular ridges or bands prominent, each be row of granules; genal furrows distinct; triangular area and flat. Free cheeks very tumid, granulated, borders thi marginal furrows distinct and terminating at the front an the glabella, the borders bear fourteen acicular spines excl the genal spines, which are also acicular, strong, slightly and long, and bear the last two or three cheek spines sutures anteriorly straight and nearly parallel with th centre, posteriorly parallel with the lateral extensions of th cheeks. Neck furrow shallow generally, but deep at its ju with the axial furrows, its lateral extensions interrupted tumid ends of the neck ring, thence moderately distinct ac posterior borders of fixed cheeks. Neck or occipital ring intensely arched backwards, ends nodular, granulated, and tubercle present. Eyes prominent, of medium size, con faceted.

Thorax. –Consists of nine segments, suboblong or subfu

acicular spines, except in the case of the first pair of pleuræ on each lobe, which are very rudimentary; the spines of the third pair equal the length of the thorax and tail together, and are lected backwards at about 45°, each succeeding pair increasing ı backward flection till those from the last pair are rectangular ı the thorax.

Pygidium.—Widely triangular, rather flat, strongly granu-ed; front margin straight between the fulcra, thence backwards an angle of 45° nearly. Axis short, consisting of one ry prominent ring and terminal piece, the latter clearly arated from the former by a furrow, and bearing a small t distinct and persistent granule on each side, and is also rly circumfurrowed. From the ends of the axis ring end a pair of pleural ridges obliquely and distinctly across lateral lobes, and are produced into the axial or pleural spines. e lobes divided into two lobes, one pair of pleural furrows sent, border bearing twelve to fourteen acicular spines, two rmediate and four to five exterior to the axial pair; the first on each side adjacent to the anterior face are rudimentary seldom visible when the tail is attached to the thorax; the ıral pair have a length equal to half the length of the thorax; rmediate pair appear to be about two-thirds as long as the al pair; all bear a row of granules.

)bs.—This species is one of those figured by the late Mr. Felix tte,* and placed by him near *O. Leonhardi*, Barr., although was careful to point out that it did not strictly accord with ıt Trilobite.

From the preceding form, *O. bowningensis*, nobis, it may be at e distinguished by possessing a segment less in the thorax, by presence of frontal spines or serrations to the glabella proper, l so far as we are able to discern, by the thoracic pleuræ being spinate only; furthermore, it is a more slender species. The al spines are very different, as are also the pygidium and other ts.

* Proc. Linn. Soc. N.S. Wales, 1887, ii (2), Pt. 2, p. 99, Pl. ii. figs. 2-4.

rely on other characters of possible specific v
the spines of our form are much longer and s
O. Leonhardi, the anterior ones of ours, to
backwards at a greater angle; the genal spine
on the two anterior pairs of the thoracic pl
pairs of pleuræ have very rudimentary spine
of itself that clearly separates it from *O.*
congeners. The frontal margin of the glal
spined or serrated, but the margin of *O. L*
The pleural spines are more graduated in
backwards, producing a remarkable frill-lik
Rattei, whilst the characters of the pygidiu
In *O. Leonhardi*, between the axial or ple
peripherals, and exterior to the former two
either side. In *O. Rattei*, on the other hand,
specimen two peripheral spines occupying t
four to five the second; but in another typical
there are two peripherals in the first and
second position. We have never seen t
pygidium of *O. Rattei* between the axial or
it is wider and the spines larger, longer a
length than is the case with those of *O. Leo*

The normal number of spines that can be
of *O. Rattei* when attached to the thorax is
number twelve, the one on each angle bei
mentary, and in some specimens bifurcate

gments are present, they are so much reduced in size as to dicate a transition towards *O. Rattei.*

Named in honour of the late Mr. Felix Ratte, Mineralogist to e Australian Museum, Sydney.

Loc. and Horizon.—Bowning Village, Co. Harden, Middle l Upper Trilobite Beds—Bowning Series (= *Hume Beds*, Jenkins, l *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

ODONTOPLEURA PARVISSIMA, *sp.nov.*

(Pl. L., figs. 4-6; Pl. LII., fig. 8.)

daspis near *A. Dormitzeri*, Ratte (non Corda), Proc. Linn. Soc. N.S. Wales, 1887, ii. (2), Pt. 2, p. 96, t. 2, f. 1, 1 bis.

Sp. Char.—*Body.*—Suboblong-oval. *Cephalic shield or cephalon.* Subquadrate, twice as wide as long, tumid and strongly ercled throughout. Glabella quadrate, half as long as the thorax, ncluding the neck ring its length equals the width between the s; central lobe narrow, intensely arched transversely, moder-y so fore and aft, extending to the front or limb, which is ight and appears under a strong lens to be delicately tate; the lateral lobes mere tubercles; lateral and false rows distinct; axial furrows indistinct. Fixed cheeks very ll and tumid; genal lobes very small (practically narrow bands n bearing a row of tubercles); genal or palpebral furrows lerately distinct; ocular ridges distinct anteriorly and tubercled. s very small and prominent. Free cheeks proportionately e, tumid, outer borders thickened, narrow, and each bearing ten rt acicular horizontal spines, and on the upper surface a row rominent tubercles; genal angles produced into long, slender subfalcate spines. Facial sutures distinct, anteriorly gently ving towards the axis and passing out at the front angles of the tral lobe; posteriorly are parallel with the edges of the lateral ensions of the fixed cheeks, and pass out at the genal angles. k furrow distinct, narrow, lateral extensions faint. Neck g intensely arched, lateral nodules small, but distinct, ercled, but no prominent central tubercle.

Thorax.—Possesses nine segments, nearly square, greatest width equal to its length. Axis prominent, wider than the pleural lobes; rings faintly nodular at ends, dorsally each bearing two prominent tubercles. Axial furrows distinct. Lateral lobes narrow; pleural ridges and sutures very distinct, each pleural ridge bearing two very prominent tubercles, one at the fulcrum and the other near the axial furrow; at least seven pairs of pleuræ bear acicular spines, those on the third pair (none visible on the first and second pairs) are short, and at right angles with the axis, each succeeding pair have an increasing backward flexion till the last pair are parallel with the axis, they also increase in length posteriorly; the fifth, sixth and seventh pairs are subfalcate, the eighth and ninth pairs in some specimens show indications of having stood upright.

Pygidium.—Very small, widely triangular, distinctly tubercled. Axis very prominent, consists of one ring and small terminal piece; both bear a pair of small tubercles. Lateral lobes divided into two pleuræ by the pleural ridges extending from the ends of the axis ring; these ridges are bituberculate; the border bears eight acicular spines of nearly uniform length, four intermediate and one on each side of the principal pair. Axial furrows distinct.

Obs.—This species was briefly described by Mr. F. Ratte,[*] and determined by him to be near *O. Dormitzeri*, but he pointed out

free cheeks, and in the structure of the pygidium, in which characters it also differs from *O. Rattei*, nobis. The tuberculation is singular among the known Australian species. It resembles *O. Rattei* in the proportionate length to width of the cephalon, and in the pleuræ being unispinate.

In form it approaches *O. minuta*, Barr., but as the late Mr. Ratte pointed out, it bears only two rows of tubercles on the pleural lobes, while on those of *O. minuta* there are three rows; and the largest of our specimens is not more than half the size of that fossil. The genal and pleural spines are much larger in ours than in the Bohemian species.

Mr. Ratte seems also to have erred in fixing the number of cheek spines at fourteen. We find them to be ten; and they occupy two-thirds of the border, the anterior third being spineless.

From *O. Dormitzeri* our species differs in having a much more quadrate cephalon, a highly granulose pygidium, and an absence of the axial pleural spines. It is much nearer to *O. minuta*, Barr., and this is in all probability its nearest ally. The distinguishing features of *O. parvissima* are—(1) The semicircular curve of the borders of the free cheeks; (2) the fine acicular cheek spines; (3) the subfalcate pleural spines; (4) the tubercled pleural ridges; (5) the uniform tail spines, and absence of strong pleural ridges (pads) on the pygidium; (6) the small central and lateral glabella lobes; (7) the remarkably strong tuberculation of the whole test; (8) its minuteness; and (9) the equality in the length of the thorax and width of the head-shield.

Our Pl. L., fig. 4, is drawn from the same specimen as Mr. Ratte's t. 2, f. 1, bis.

Loc. and Horizon.—Bowning Creek, Co. Harden, Lower Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock. *Coll.*—Mitchell.

ODONTOPLEURA JENKINSI, *sp.nov.*

(Pl. LII., figs. 6-7; Pl. LIII., figs. 4-7.)

Acidaspis Brightii, Jenkins (*non* Murch.), Proc. Linn. Soc. N.S. Wales, 1879, iii., p. 221, t. 17, f. 5.

Acidaspis Prevosti, Ratte (*non* Barr.), *loc. cit.* 1886, I. (2), Pt 4, p. 1069, t. 15, f. 12 (excl. f. 11).

Sp. Char.—This species is so near *O. Rattei*, nobis, that it will be sufficient for us to state the points of difference between the two fossils on which we rely for justification in separating them. In *O. Jenkinsi* the limb or margin in front of the glabella is smooth instead of being dentated as in *O. Rattei;* each pleura of the thorax bears two prominent tubercles, and some of the anterior pairs four, the axis also appears more prominent. The pygidium carries the same number of spines as that of *O. Rattei*, but four of them are constantly intermediate of the principal or axial pair The side lobes are more distinctly ridged and furrowed, the ridges are surmounted by very distinct rows of tubercles. The pleural ridges from the axial ring are less prominent than they are in *O. Rattei*, but the tuberculation is more conspicuous throughout.

Obs.—We hesitated very much about according this form specific separation from *O. Rattei*, and we do so only after examining a great number of specimens and finding that the characters already pointed out were constant, and because it comes from a higher horizon and is not found associated with *O. Rattei* in the lower horizon, where that fossil is very numerous.

We believe that this is the Acidaspid described and figured by

Genus CERATOCEPHALA, Warder, 1838.

ephala, Warder, Am. Journ. Sci., 1838, xxxiv., p. 377.

cera, Corda, Prod. Bohm. Trilobiten, 1847, p. 158.

cera, Angelin, Pal. Scandinavia, 1878 (Lindstrom's edit.) p. 34.

phala, Clarke, 10th Ann. Rept. State Geol. N. York for 1890 (1891), p. 67.

—Mr. J. M. Clarke has already indicated the lines on this name should be used, and it is here adopted by us in nity with his researches, except that we employ it as one genera of the Odontopleuridæ rather than as the typical name of the whole group, superseding *Acidaspis*, for already given.

Australia *Ceratocephala* is represented by four species, so we have been able to ascertain, viz.:—

Ceratocephala Jackii, nobis.
,, *Vogdesi*, ,,
,, *impedita*, nobis.
,, *longispina*, Mitchell.

last may possibly appertain to the genus *Selenopeltis*, Corda.

CERATOCEPHALA VOGDESI, *sp.nov.*

(Pl. L., figs. 8 and 9, Pl. LI., figs. 1-7, Pl. LIII., fig. 9.)

pis Verneuili, Ratte (*non* Barr.), or *A. vesiculosa*, Ratte (*non* *yr.*), Proc. Linn. Soc. N.S. Wales, 1886, i. (2), Pt. 4, p. 1066, 15, f. 5-10.

pis Prevosti, Ratte (*non* Barr.), *Loc. cit.*, p. 1068, t. 15, f. 11 (excl. f. 12).

Char.—Suboblong or oblong-ovoid. *Cephalic shield or* *n.*—Suboblong, of complex structure, moderately tumid, and tuberculate throughout, twice as wide as long, front rather straight and centrally slightly projecting; tubercles ous sizes, and some very conspicuous. Glabella. Central rge, suboblong, front lateral expansions very distinct, only

absent, median pair subconical or subtriangular
very moderately tumid, basal pair large, s
rounded outer margins; first pair of glabella
wide, second pair shallow towards the axial f
towards the false furrows, both pairs uniting the
the false furrows; false furrows wide and deep; a
wide, distinct, shallow along the median portion
large; genal lobes large, ridged, tumid, subtriang
lateral lobes of the neck ring by the genal
abruptly into the lateral extensions of the neck
some very large tubercles. Genal or palpebral fu
distinct and highly tubercled. Eye or palpebra
prominent and triangular. Ocular ridge ver
overhanging the facial sutures. Eyes small
subpedunculate, fixed obliquely outwards ar
forward, remarkably near the front margin, ver
distance between them being equal to the diago
of a genal spine, and the point at which the faci
front margin on the opposite side of the glabe
quarter times the length of the cephalon. Neck
shallow behind the central glabella lobe, narrow
the basal glabella lobes and the lateral lobes of
lateral extensions (as are the axial furrows also
by the genal lobe ridges, and from the genal lobe r
widely and deeply to the bases of the genal spi
anteriorly, passing (deeply under the eyes) to th

and under the ocular ridges, passing out in a line with the outer edges of the median glabella lobes, and cutting the margins at an angle of about 25°. Free cheeks subtriangular or subcrescentic, much expanded at the front lateral angles, from thence to the genal angles rather straight and inclining inwards, highly tuberculate and rugose; genal spine ridges strong, very prominent, and vanishing under the eyes; borders distinct, strap-like, smooth and entire: marginal furrows faint; genal angles almost in a line with eyes, axially, bearing strong, suberect, long arching spines, which will apparently reach to the fifth or sixth thoracic segment.

Thorax.—Unknown in a complete state, probably consisting of ten segments, and as wide as long; very conspicuously tuberculated and granulated, and flat. Axis very distinct, very moderately arched vertically, ends of segments very distinctly separated from the central portion by furrows, strongly inclined forwards, and with a very joint-like character, only moderately tumid; central portion of segments without backward arch, each segment bearing two prominent tubercles, one on either side, about midway between the nodes and the central line; articulating surfaces very large, furrows distinct. Lateral lobes horizontal; ventral ridges of the pleuræ on the inner halves as wide as the pleuræ, thence contracting to the bases of the pleural spines and leaving low grooved triangular areas on each side, of which the anterior ones are the largest, they are furrowed along the central line from the bases of the spines for about half of their length; the interpleural furrows very deep and wide; sutures distinct, straight and rectangular to the axis. Pleuræ bispinate, principal or upper spines very long, barbed, and on the anterior pleuræ subhorizontal, and subrectangular to the axis, subarcuate with reflected ends, posterior ones having sharply backward and upward directions; posterior pair at least rising perpendicularly from the pleuræ with their extremities converging towards each other, and originating some distance short of the extremities of the pleuræ; the secondary or inferior spines originate almost immediately under the principal spines, are stout, cylindrical, flected sharply downwards and forwards at about 30° and barbed with acicular

spines ; each pleura bears a nu
four, along the front margin of tl
posterior margin, two of them ve
angle adjoining the axial furrows.
a short distance from the axial f
is the whole surface of the ple
tubercles : the tubercles from
posterior pair of pleuræ are v
distinct.

Pygidium.—Proportionately v
four times wider than long, arcifo
intensely arched ring; axial furr
inwards behind the axial ring ;
tinct, lateral angles acicular and
spines are seven in number, ve
uniform, and strongly barbed and
ing from the axial ring.

Obs.—On the nodes of the axis
confluent and form ridges para
posterior pleural spines when deco

The late Mr. Ratte was right i
allied to *C. Verneuili* and *C. vesicu*
parison of ours with the figures of
we find it possesses so many fe

C. *Verneuili*, however, the pleuræ are flattened from above similar to our figures of *C. Vogdesi.*

: same features separate it from *C. vesiculosa.*

Ratte referred to the disputed point of the existence of iculation between the pleuræ and the axial segments, said st in some trilobites by Emmrich, and disputed by Bur-r, the latter being upheld by Barrande. Mr. Ratte basing nions upon certain features one of our figured specimens s, was inclined to support Emmrich's view. He says:— cannot help being struck in examining the specimen in n at the great resemblance to an articulation of the n of the axis with the pleuræ. It seems as if the test (or ferent joints) had been covered by a thin epiderm as ed by Burmeister,* and that this epiderm is wrinkled at iculation as shown in fig. 5, and especially in the enlarged fig. 8."†

lst admitting the very joint-like appearance, somewhat rated in Ratte's figure, we do not see any direct evidence jointing; but, on the contrary, there is one strong feature e observed which disposes of the question in favour of the e, and, that is, in all the many thoracic segments which ome under our notice, we have never seen a specimen l at this point.

joint-like appearance at the ends of the thoracic axial ts is also seen in the type of *Selenopeltis* (*S. Buchii*, sp.)

e figured the principal tubercles of the pleuræ surrounded mplete circlet of granules in every respect resembling the y tubercle and its miliary ring on the interambulacral of an ordinary Echinid, such as the genus *Cidaris.* His correctly represent the specimen used by him, but on no pecimen can we find this feature nearly so distinct.

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* Barrande, loc. cit. p. 231.

† Proc. Linn. Soc. N.S. Wales, I. (2), p. 1068, t. 15.

This is the largest Odontopleurid yet discovered, and seems to agree in size with *C. Verneuili*, its European analogue. When mature it appears to have been from four to five inches long.

We have had the advantage of studying the specimens provisionally referred by Mr. Ratte* to *Acidaspis Prevosti*, Barr. One of these (his fig. 11) we believe to be the present species, although Mr. Ratte represented spines along the frontal borders of the cephalon which do not exist in the specimen, whilst he neglected to figure the genal and occipital spines that are preserved. This specimen also shows the subpedunculate protruding character of the eyes.

Named in honour of our valued correspondent, Capt. Anthony W. Vogdes, U.S. Artillery, San Francisco, author of the highly useful "Bibliography of the Palæozoic Crustacea."

Loc. and Horizon.—Bowning Creek, Bowning, and Limestone Creek, near Bowning, Co. Harden, Lower Trilobite Bed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass Beds*, David)—? Wenlock.

Coll.—Mitchell; Australian Museum, Sydney; Geological Survey of N.S Wales, Sydney.

CERATOCEPHALA JACKII, *sp. nov.*

(Pl. LIII., fig. 8, Pl. L. fig. 6.)

derately tumid; ocular ridges filamentous, and distinctly bercled; genal or palpebral furrows distinct, particularly teriorly; palpebral lobe very small. Eyes very small, distance tween them is to length of the cephalon as 10·7, or a little eater than the distance between a genal spine and the alternate ck spine. Free cheeks of moderate size, moderately tumid, erally expanded beyond the genal angles, suboval; borders le, tumid, each bearing a row of four distinct tubercles on the dian line, and at least sixteen stout, horizontal spines, all ring a forward direction and apparently increasing in length m front to back to the twelfth, from which each succeeding is a little shorter; marginal furrow wide and distinct between facial sutures and genal angles, where they terminate. Genal es straight, acicular, subslender, and forming an angle of °with the posterior border of the cephalon, or of 120° with straight line joining their bases, apparently of moderate gth. Facial sutures anteriorly nearly straight, inclining ards at an angle of 45° and passing out in front of the axial rows, dividing the greatest width of the cephalon into three al parts nearly, posteriorly arciform, passing out at the genal les. Neck furrow wide and shallow, centrally deeper between false and axial furrows, lateral extensions interrupted by the al lobe ridges, distinct between the genal lobe and the genal le ridges. Neck ring indistinctly separated from the neck ow, very moderately arched, curved sharply backward, side s small. Occipital spines subslender, projecting backward, but slightly raised and curved.

horax.—Unknown in a complete state. Pleuræ horizontal, flat, ra very indistinct, ends not deflected nor thickened, bispinate; erior spines strong, and projecting from the posterior angles he pleuræ; anterior ones swimmeret-like or dagger-shaped, nsely barbed, directed forward and originating in the front les of the pleuræ, so that the two spines on each of the erior pleuræ at least have their points widely divergent from 1 other.

ygidium.—Unknown.

Obs.—The glabella of this species is very similar to that of *C. longispina*, Mitchell (*Acidaspis longispinis*, Mitchell), but here the specific resemblance of the two species ceases. The cephalon of *C. Jackii* has a greater proportionate width, and its spined free cheeks, shorter and slender occipital, genal and pleural spines, and the very different anterior pleural spines clearly separate it from the former.

From *C. Vogdesi* it is so different that comparison is needless. For the same reason we need not enter into any explanation to differentiate it from *C. Verneuili* and *C. vesiculosa*, Barr. From *C. Dufrenoyi* it is distinguished by the much less quadrate outline of the cephalon in that species, nor does this species possess the expanded anterior lateral portions (free cheeks) of *C. Jackii*. The same feature also distinguishes it from *C. mira*, Barr., and in addition also the highly pedunculated eye of the last named is a strongly differentiating character. On the other hand like *C. Jackii*, Barrande's species possesses the peculiar swimmeret-like spines on the thoracic pleuræ. Lastly, in *C. Prevosti* these spines are replaced by short simple ones, whilst the proportions of the cephalon entirely disagree with those of *C. Jackii*.

Named in honour of Mr. R. L. Jack, Government Geologist of Queensland, who collected the specimens.

Loc and Horizon. Bathurst Road, near Bowning, Co. Harden

ng, narrow, very tumid, and granulated, subequal in
l not fully separated from each other by the basal
rrows on the outer sides; false furrows very deep and
ian glabella furrows very deep, basal pair shallow, wide
ιite passing into the axial furrows; axial furrows dis-
ιarrow, and passing rather clearly over the genal lobe
ixed cheeks of moderate size; genal lobes very tumid,
'uptly into the furrows of the lateral extensions and
re gradually anteriorly: ocular ridges indistinct, very
s; palpebral furrows distinct anteriorly; triangular areas
'al extensions short. Neck furrow wide, trough-like,
between the false and axial furrows, faint over the
ridges, thence narrow but distinct. Neck ring robust,
' distinctly arched; side lobes or nodules very small,
Occipital spines acicular and only moderately robust,

ιorax, pygidium, and free cheeks are unknown. It
nearer to *C. Jackii* than any other known Australian
l from this it is readily separable by the much greater
f the cephalon and its distinctive granulation; the
ral glabella lobe and its greater convexity; the longer,
and more tumid lateral glabella lobes; the shorter
ensions of the fixed cheeks; by the more ridge-like pro-
ntal glabella expansions and its prominent tubercle;
by the very small lateral lobes of the occipital ring.
rtionate width between the eyes and length of the
also different in the two species. From *C. longispina*
ted by the same characters.
l Horizon.—Bowning Village, Co. Harden, Middle
ed—Bowning Series (= *Hume Beds*, Jenkins, and *Yass*
d)—? Wenlock. *Coll.*—Mitchell.

CERATOCEPHALA LONGISPINA, *Mitchell, sp.*

(Pl. LIII., fig. 10; Pl. LIV., figs. 1-5.)

ιear *A. mira*, Ratte (*non* Barr.), Proc. Linn. Soc. N.S.
Wales, i. (2), Pt. iv. p. 1069, t. 15, f. 13, 14.

Acidaspis longispinis, Mitchell. Proc. Linn. Soc. N.S. Wales 1888, iii. (2), Pt. 2, p. 398, t. 16, figs. 7-12.

Sp. Char.—*Body* oval, suboblong. *Cephalic shield or cephalon* only moderately tumid, and distinctly but sparsely granulated. Glabella with the central lobe suboblong, very moderately arched, and sloping gradually into the neck furrow and to the front margin, front angles moderately expanded and bearing distinct tubercles, three pairs of side lobes present, first very small, depressed, second and basal pair large, subcircular, moderately tumid and nearly of equal size; false furrows distinct and very wide; glabella furrows—first pair faint, second pair deep and distinct, uniting the axial and false furrows, basal pair very wide and shallow, also uniting the axial and false furrows; axial furrows very faint anteriorly and moderately distinct posteriorly, genal lobes small, distinctly and regularly granulated, prominent posteriorly, inconspicuous anteriorly; palpebral furrows distinct anteriorly; ocular ridges prominent, filamentous, and distinctly granulated; lateral extensions of the fixed cheeks robust, having very prominently thickened borders. Facial sutures anteriorly straight, and making angles of 120° degrees with the front margin, posteriorly straight, passing out at the genal angles, and making angles of 35° with the posterior borders of the cephalon. Eyes prominent, convex, numerously and minutely faceted. Free cheeks of moderate size

.—Apparently consists of nine segments, length equal to , sparsely granulated; axis prominent and as wide as obes, nodules inconspicuous; axial furrows moderately ateral lobes horizontal, pleural ridges moderately con- the anterior pleural margins raised into ridges, and the pleuræ the appearance of being centrally furrowed being ridged; pleural spines on the first, second and s of pleuræ moderately reflected and much smaller than ited more posteriorly; the latter are very long, hastate, d intensely flected backwards, centrally fluted when l; secondary or anterior spines small, paddle-shaped, having entire margins, and the appearance of articu- he pleuræ.

m.—Triangular, two and a half to three times as wide as ulated distinctly; axis very prominent, one-half to two- the length of the pygidium, unsegmented, bearing one ring; axial furrows faint; side lobes flat, undivided, f pleural ridges present, extending from the ends of the borders inconspicuous; pleural spines strong, acicular, ;, and about as long as half the pygidial width, but these the border is practically entire, although under a ninute spination or serration is visible along the whole

[r. Ratte figured (*loc. cit.*) two imperfect glabellæ of s and referred them to *A. mira*, Barr., but as will be n by a comparison of the descriptions and figures of ssils they are widely dissimilar. This species was after- racterised, fully described and figured by one of us.

spina is so clearly distinct from all the other Australian the genus that it is unnecessary to point out the es. Its chief characteristics are: the practically spine- borders; presence of three pairs of lateral glabella lobes; large occipital spines which are borne by a cowl-like originating at the back of the central glabella lobe, originating in the occipital ring; the massive principal

pleural spines and non-serrated secondary spi
spinate pygidium; prominent and clearly facet

Many cephalons occur from which the cov
separated, and left the occipital ring quite
appearance spineless.

C. longispina attains a length of two and
The pygidium bears a very close resemblance to
Buchii, Barr., sp., in its spineless margin otl
spines.

The cephalon represented in Pl. LIV., fig. 2,
spines that exhibit a decided tendency to curl
those of *Selenopeltis Buchii*, Barr. More cor
our form may determine the necessity of trans
genus.

Loc. and Horizon. Bowning Village, C
and Upper Trilobite Beds – Bowning Series (=
and *Yass Beds*, David). *Coll.*—Mitchell.

EXPLANATION OF PLATES

Plate L.

ODONTOPLEURA BOWNINGENSIS, *E. a*

Fig. 1.—A nearly complete specimen, but with the
and the various portions of the cephal

CERATOCEPHALA VOGDESI, *E. and M.*

8.—Portion of a cephalon, with the right genal spine preserved and the right occipital spine indicated (× 2). *Coll. Mitchell.*

9.—Bispinate distal end of a thoracic pleura, the spines barbed; slightly enlarged. *Coll. Mitchell.*

Plate LI.

CERATOCEPHALA VOGDESI, *E. and M.*

—Portion of a thorax showing the peculiar distal termination of the axial segments, tubercles of the pleuræ, and large and strong spines of the latter; somewhat reduced. *Coll. Australian Museum, Sydney.*

—Portion of another thorax exhibiting the bispinate character of the distal ends of the pleuræ; somewhat reduced. *Coll. Mitchell.*

—Cephalon showing the nature of the genal and occipital spines and position of the eyes; slightly reduced. *Coll. Mitchell.*

—The last thoracic segment with its perpendicular spines; slightly reduced. *Coll. Mitchell.*

—Pygidium with its barbed spines; slightly reduced. *Coll. Mitchell.*

—A principal tubercle from one of the pleuræ of fig. 1; highly magnified.

—A principal tubercle from a similar position on fig. 2; highly magnified.

ODONTOPLEURA RATTEI, *E. and M.*

—Glabella without the side lobes, showing granulation and occipital tubercle; slightly enlarged. *Coll. Mitchell.*

—Free cheeks; somewhat enlarged. *Coll. Mitchell.*

Plate LII.

ODONTOPLEURA RATTEI, *E. and M.*

—A nearly complete specimen (× 2½). *Coll. Mitchell.*

—A cephalon without the free cheeks, &c. (× 2½). *Coll. Mitchell.*

—The pygidium with strongly developed spines (× 3). *Coll. Mitchell.*

—Portion of the two posterior thoracic segments, and the pygidium (× 2½). *Coll. Mitchell.*

ODONTOPLEURA BOWNINGENSIS, *E. and M.*

—The four posterior thoracic segments and the pygidium (× 2½). *Coll. Mitchell.*

Fig. 7.—Pygidium only, showing pleural ridges a
slightly enlarged. *Coll. Mitchell.*

ODONTOPLEURA PARVISSIMA, *E. an*

Fig. 8.—Free cheek with genal and marginal spines,
Mitchell.

Plate LIII.

ODONTOPLEURA RATTEI, *E. and*

Fig. 1.—Cast from an impression of an almost perf
of pygidium incorrectly shown; some
Mitchell.

Fig. 2.—Thorax and pygidium, the two anterior se
devoid of pleural spines; somewhat e
Survey Queensland, Brisbane.

Fig. 3.—Free cheek; slightly enlarged. *Coll. Mitche*

ODONTOPLEURA JENKINSI, *E. and*

Fig. 4.—An almost complete example, with a single
either side; somewhat enlarged. *Coll.*

Fig. 5.—Three thoracic segments with from two to
position; somewhat enlarged. *Coll. Mi*

Fig. 6.—Glabella with its lateral lobes and extens
and one free cheek; slightly enlarged.

Fig. 7.—A second glabella; slightly enlarged. *Coll.*

CERATOCEPHALA JACKII, *E. and*

Fig. 8.—Impression of the cephalon; slightly enlarg
Queensland, Brisbane.

CERATOCEPHALA VOGDESI, *E. and*

Fig. 9.—Pygidium with its large dentate spines; som

2.—Another and less perfect specimen; slightly enlarged. *Coll. Mitchell.*
3.—A third example; slightly enlarged. *Coll. Mitchell.*

Plate LIV.

CERATOCEPHALA LONGISPINA, *Mitchell, sp.*

—Portion of the cephalon and thorax; slightly reduced. *Coll. Mitchell.*
.—Cephalon less the free cheeks, with the occipital spines *in situ*, the left one showing a tendency to curl under as in the genus *Selenopeltis*; somewhat enlarged. *Coll. Mitchell.*
—A similar specimen; somewhat enlarged. *Coll. Mitchell.*
—Free cheek, with the eye *in situ*; somewhat enlarged. *Coll. Mitchell.*
.—Distal end of one of the posterior thoracic pleuræ with its enormously elongated spine; somewhat enlarged. *Coll. Mitchell.*
—Crushed cephalon and thorax, with the position of the occipital spines indicated; somewhat enlarged. *Coll. Geol. Survey Queensland, Brisbane.*

Plate LV.

:ural diagrams of the cephalon of *Odontopleura* and of *Ceratocephala*.
. - *Odontopleura.*
.—*Ceratocephala.*

Reference Letters.

Central lobe of the glabella. *bb.* Anterior lateral lobes of the glabella ›m present). *cc.* Median lateral lobes of the glabella. *dd.* Basal or pair of lateral glabella lobes. *ee.* Lateral lobes of the neck ring. *ff.* l or cheek lobes (in *Odontopleura* mostly very rudimentary). *gg.* l spines. *hh.* Neck furrow. *iiii.* False furrows. *jj.* Front lateral nsions of the central lobe of the glabella. *kk.* Lateral cheek furrows. Cheek borders with spines. *no.* Ocular ridge. *on.* Posterior extension ular ridge present in some *Ceratocephala*. *oo.* Eyes. *p.* Palpebral , very small in *Odontopleura*. *q.* Genal spine ridges. *r.* Neck ring. :cipital spines. *tt.* Palpebral furrow. *xxxxx.* Axial furrows. *yy.* ral extensions of the neck furrow. *ww.* Genal lobe ridges, joining the l lobes to the lateral lobes of the neck rings and interrupting the il extensions of the neck furrow. *fs.fs.* Front border of the glabella, times bearing fine spines. *fs.o.fs.* Facial sutures, sometimes not ed or soldered as in the case of *C. Vogdesi*, nobis. *ix.ix.ix.ix.* Lateral lla furrows, seldom more than two pairs present. *tri.* Triangular , very small or absent from *Ceratocephala*. *hr.* Branches of the neck w or continuations of the false furrows. *tu.* Central tubercle of the ring. *fs.x.* Thickened borders or ridges of lateral extensions of the cheeks.

TWO ADDITIONS TO THE FUNGI OF NEW SOUTH WALES.

By D. McAlpine.

(Communicated by J. H. Maiden, F.L.S.)

1. Puccinia hieracii, Mart.

Hawkweed Puccinia.

On both surfaces of leaves of *Hypochaeris radicata*, L. October. Wagga Wagga, N.S.W. (Maiden). Not hitherto recorded for New South Wales.

2. Capnodium callitris, McAlp., n.sp.

Murray Pine Capnodium.

(Plate lvi.)

Black, widely effused, not readily separating and then in small particles, giving a sooty appearance to the dark green branches

lourless fringe at mouth. *Pycnospores* at first colourless, then greenish, and finally yellowish-brown, end cells often colourless, ellipsoid, 5-septate and septa stout, 22-24 × 9-11 μ. *Perithecia* simple, dark coloured but dark green when crushed, and walls irregularly netted, with more or less globular or oval head, often supported by stout body, papillate at apex when ripe and extruding plug of dirty yellow material, 170-280 × 90-156 μ or even larger. *Asci* fusoid-clavate, sessile, apex rounded, 8-spored (79 × 26 μ). Sporidia at first colourless, then pale green, finally dark brown, oblong, constricted at the middle, 3-septate, and usually longitudinally divided, often in each division, 17-19 × 8-9½ μ.

The various reproductive bodies are intermixed. Pale green glomeruli (*Heterobotrys*) are also present.

On *Callitris robusta*, R.Br. October. Wagga Wagga, N.S. Wales. (Maiden).

Besides the gonidia, detached portions of the hypha probably serve as such, and there are many-celled swollen bodies, between the ordinary cells, which likely have the same function. The spermogonia vary considerably in shape, but the rod-like spermatia are very characteristic. The pycnidia are easily recognised by their long and usually straight neck, composed of elongated twisted filaments and reaching a length of 190 μ, apart from the body. The fringed mouth is in contrast to that of the perithecium which is papillate and splits irregularly. The pycnospores are at first unicellular and colourless, borne at the end of colourless, jointed filaments. They soon develop two or three septa and become greenish, then finally turn brown on maturity, with 5 septa constantly. It is interesting to observe that the same changes of colour are seen in the sporidia. There is a species of Capnodium (*C. australe*, Mont.) found in Australia on Conifers, but it differs from this one in several important respects. The perithecia are dichotomous, but here they are simple; the sporidia are 4-5-septate and not constricted, but here they are 3-septate and constricted.

EXPLANATION OF FIGURES

Capnodium callitris.

Fig. 1.—Hyphæ branched and unbranched (× 540).

Fig. 2.—Colourless moniliform hypha bearing gonidium (× 1000).

Fig. 3.—Unseptate gonidia borne by coloured hyphæ (× 1000).

Fig. 4.—Detached brown body germinating and giving rise to colour
tube (× 1000).

Fig. 5.—Spermogonium with spermatia (× 540).

Fig. 6.—Spermatia (× 1000).

Fig. 7.—Pycnidium with colourless fringe at mouth-opening (× 145).

Fig. 8.—Pycnospores (× 1000).

Fig. 9.—Pycnospores germinating usually laterally, sometimes at e
(× 1000).

Fig. 10.—Perithecium (× 270).

Fig. 11.—Ascus with 8 sporidia (× 1000).

ON SOME AUSTRALIAN ELEOTRINÆ.

BY J. DOUGLAS OGILBY.

to the present time all Australian writers on ichthyology been content to follow the author of the British Museum ogue of Fishes (*1859-1870*) in collecting all the various of the Eleotrine Gobies in a single large, heterogeneous, and eldy genus; under the common name *Eleotris* this is made to de a number of fishes, which, although having a general nblance to one another in their habits and mode of life, have loped such widely diverse structural peculiarities that the ssibility of maintaining the intimate connection inaugurated hat work, and subsequently adhered to in other important rs by the same author, becomes immediately apparent to ne to whom the opportunity of studying the fishes themselves ven.

the paper here submitted, I have, therefore, endeavoured to rate into natural groups certain of our common south-eastern ontane species, in the hope that the proposed genera will a nucleus round which to gather a part at least of our tralasian forms and so facilitate the identification of the inder.

undertaking even this partial revision of our *Eleotrinæ*, I however, placed at a great disadvantage through my inability nsult Dr. Bleeker's paper on the divisions of the *Gobiidæ*, no of which is obtainable in Sydney, nor indeed, so far as I am e, does one exist in any of the Australian Colonies. It is possible, therefore, that one or other of the four genera proposed may be identical with one of Bleeker's, but the ntage to my fellow-workers in Australia of having a clear

The only paper dealing with the divisions of
—as accepted by Australian authors—to whic
the "Review of the *Gobiidæ* of North Amer
Jordan and Eigenmann,* and I am unable to
five species described below with the genera th

Though somewhat irrelevant to the subje
paper, as set forth in its heading, a short acco
to be met with in the waterholes near Sy
favourite haunts of the fishes of this subfam
interesting and instructive, as a proof of th
which even a small and to all appearance
puddle may possess towards elucidating some
our fresh-water fauna; and the fact of th
brilliantly coloured yet undescribed a species a
within so short a distance of the metropolis,
to the possibilities dependent on a systematic
waterholes and overflow ponds in the more re
Colonies, while it is a tangible demonstratio
ignorance which prevails among us in regard t
and interesting forms of animal life which in
and ponds.

I shall make, therefore, no further apolog
here the following account of a collecting tri
April in company with Mr. J. D. Grant, Insp
to the Liverpool district, and which produ
unexpected by me.

Mullet, which was said to be found in the George's River the weir at Liverpool and in the adjacent waterholes, and , my informant assured me, differed greatly from any of inhabiting the estuary, in which it was very rarely obtained, ıen only after severe floods, by which a few of these fishes the fresh-water Herrings *(Potamalosa novæ-hollandiæ)* are ınally swept down over the weir from the upper reaches of 'er.

pools which we netted are merely drinking-places for either of artificial construction or natural depressions of ıund, and are fed by the overflow from the river during flood-ıpplemented by the rainfall, or in one instance at least by on through the sandy ridge intervening between the water-ıd the river, the water always maintaining the same level two.

the time of my visit all the pools were very low in con-ıce of the long continued drought, only the one to which ıce has just been made being anywhere of a greater depth ix feet, and in it, owing to the inequalities of the bottom ıe presence of snags, assisted by the clearness of the water—sult of filtration—we were almost quite unsuccessful, our capture consisting of a single example of the Smelt *pinna)* and a young Australian River-Perch *(Percalates rum).*

latter of these species is known to occur abundantly along tire coastal region of south-eastern Australia and northern ınia, but the range of *Retropinna* is by no means so well stood, as it has been very generally confounded with *ias*; but, in such opportunities as I have enjoyed for observ-ır fresh-water fishes in their native haunts, I have not so cceeded in detecting the two genera as associating in the waters. In Macleay's Catalogue, No. 840, Vol. ii. p. 164, *Linn. Soc. N.S. Wales, vi. 1881, p. 228*) the only alian locality given is "Rope's Creek," and we may, there-ake it for granted that this was the only place known to the r from which the genus had been recorded outside of New

made in Macleay's Supplement (*1884*), though year Johnston's "Catalogue of the Fishes of *Roy Soc. Tas. 1882*) had been published, at author states that it is "found in the variou mania at certain periods of the year." Perso these fishes in the stream which flows from th matta water supply; in the Nepean River at Prospect Reservoir, where they swarm in numbers, and, as above mentioned, in the George's River; it may, therefore, be inferre is an inhabitant of most of our coastal water northward and southward extension has yet On the latter I am enabled, however, to thr small example is present among some fishes f Mr. James A. Kershaw, and the notice accor men runs thus—"Pyramid Hill (about 150 mi and north of Bendigo)"; this extension of ran an interesting addition to our meagre knowle is much less important than the fact—of wh information—that the section of country in w stands drains into the Murray River, and th district at least *Retropinna* has succeeded in cr Range.

It was in the deep pool that we expected t for which we were especially in search, an

both places I was further assured that there was a second species of Mullet found in the fresh water.

The three other pools which we fished were of much smaller dimensions, the largest about twenty-five yards by ten, the smallest not a third of that size, and nowhere exceeded four feet in depth; they were, however, crowded with fishes of several kinds; indeed it is difficult to imagine whence food could have been supplied in sufficient quantity to keep so many individuals in the healthy condition in which we found them; the only aquatic animals which I found associated with them were a small shrimp (*Palæmon, sp.*) and a large and handsome water-beetle (*Hydaticus scutellaris*), and though these were brought ashore among the weeds in considerable abundance, their numbers, unless materially supplemented from outside, were quite insufficient to bring about the results which we witnessed.

In point of numbers the ubiquitous Carp (*Carassius auratus*) of course greatly exceeded all the other species together; they were of all sizes and of all tints, from a dull olive-green or brown to gold, among the latter being some of the largest and most brilliantly coloured individuals that I have ever seen. These fishes swarm in most of the fresh waters of the metropolitan and neighbouring districts, usurping the place and consuming the food of better fishes, introduced from abroad like the rabbit and the sparrow, they have similarly thriven and multiplied, and, but for the nature of the element in which they live and their distaste for or inability to live in purely salt water, would doubtless have similarly spread with equally disastrous results to the native fishes; yet in the face of this and of the fact that they are useless as food, the "Fisheries Act" now before the country proposes to protect the "Carp" and makes it penal to offer them for sale if under five ounces in weight or by analogy to destroy them.* In

* The true Carp (*Cyprinus carpio*), a species of considerable value as a food fish—and which with the Small-headed Mullet (*Mugil ...*), the Tench (*Tinca vulgaris*) and the Gourami (*Osphromenus olfax*) might with advantage be introduced into all Government tanks, especially in the western districts—has never been acclimatised in any part of the colonies.

Both species of fresh-water Eel (*Anguilla reinhardtii*) were taken, the latter being, as is inv in this district, much the larger. The Long-finne Eel is the common eel of the New South Wales rive so that nine out of every ten exposed for sale markets belong to this species, which attains to least fifteen pounds, whilst with us a specim exceeding two pounds is a rarity, though, ac Johnston (*Proc. Roy. Soc. Tas. 1882, p. 61*) that the enormous weight of thirty pounds in some pa Both Macleay and Tenison Woods have confou with *australis*, from which it may at once be dist anterior position of the origin of the dorsal fin, w far in advance of that of the anal instead of nea as in *australis*. Roughly speaking, *australis* form, being the common fresh-water Eel of Tas and South Australia, while *reinhardtii* occupies a on the east coast from Sydney northwards to Ca

To return to the *Eleotrinæ*:—

The name "Gudgeon" is very generally acce Australia for these little fishes, having been de them by the earlier colonists on account of a cert their mode of life as well as a fancied resen appearance to the European Gudgeon (*Gobio flu*

Sexual and seasonal differences

triangular in the male, short, broad, and posteriorly emarginate in the female, while in the Carp-Gudgeons (? *Carassiopsi*) it is oblong in both sexes, with the hinder border emarginate, but that of the male is so much the longer that its lobes embrace the origin of the anal fin. In some species, also, there is a marked prolongation of some of the fin-rays in the male fish.

During the spawning season the cheeks in both sexes, but more especially in the males, become to a greater or less extent tumid, while the genital papilla of the female develops one or more series of small supplementary papillæ, forming a fringe.

These facts should be carefully borne in mind by anyone lescribing or identifying a species from a single individual.

Breeding.—I have been unable to find any account of the ɔreeding habits of the Eleotrids, or the means employed, if any, o ensure the safety of the eggs and newly hatched young and to uard against hybridisation, but the fact that in a single small ool many pairs of these fishes, belonging to three different pecies, were simultaneously engaged in spawning, and that no ybrid has ever been recognised, clearly suggests that nests of ɔme sort are formed for the reception of the eggs.* Where the ests are situated and whether the ova when deposited are watched ver by the parents must be left for future investigation to decide, ut there was no appearance of any such construction among the eeds drawn ashore by the net.

Appended is a synopsis of the genera proposed in this paper:—

i. Abdominal vertebræ more numerous than the caudal; sexes dissimilar in colour, similar in the shape of the genital papilla.

A. Head deeper than wide; mouth small; outer series of mandibular teeth slightly enlarged; gill-openings narrow; six branchiostegals; genital papilla large; head partially scaly ... ...

CARASSIOPS, p. 732

* This is known to be the case with some at least of the allied marine ɔbies.

ii. Abdominal vertebræ less numerous than the caudal; sexes similar in colour, dissimilar in the shape of the genital papilla.

A. Head as wide as deep; mouth small; outer series of teeth slightly enlarged; gill-openings narrow; five branchiostegals; genital papilla large; head partially scaly.

a. First dorsal with 7 rays; fourth ventral ray produced and filiform; pectoral with not more than 16 rays; scales large; cheeks and interorbital space scaly ... KREFFTIUS, p. 736

a'. First dorsal with 6 rays; fourth ventral ray not produced; pectoral with not less than 18 rays; scales moderate; cheeks mostly, interorbital region entirely naked ... ... MULGOA, p. 740

A'. Head wider than deep; mouth large; gill-openings wide; six branchiostegals; genital papilla small; head almost entirely naked ... ... OPHIORRHINUS, p. 745

CARASSIOPS, gen.nov.

Eleotris, sp. auctt.

Body oblong and compressed, the back rounded; head rather

[redacted]

behind the second dorsal, with i 10-11 rays; ventral fins well developed, not in contact basally, inserted behind the base of the pectorals, with i 5 rays, the fourth soft ray produced and filiform; pectoral fins moderate and pointed, with 13 or 14 rays, the middle ones the longest; caudal fin rounded, the peduncle strong. Genital papilla large, scales large and somewhat deciduous, those of the tail a little larger than those of the trunk; head partially scaly; scales of the head and anterior part of the body cycloid, the remainder ciliated. Vertebræ 25 (14 + 11).

Etymology.—*Carassius*, a Carp; ὤψ, resemblance.

Type.—*Eleotris compressus*, Krefft.

Distribution.—Coastal regions of Eastern Australia.

CARASSIOPS LONGI, sp.nov.

Long's Carp-Gudgeon.

D. vi, i 9. A. i 10. P. 13-14. Sc. 27-29/8. Vert. 14/11.

Body moderate, the tail not conspicuously compressed. Length of head $3\frac{7}{10}$ to $3\frac{9}{10}$, depth of body $3\frac{3}{5}$ to 4 in the total length; depth of head $1\frac{1}{3}$ to $1\frac{4}{5}$, width of head $1\frac{7}{10}$ to 2, of the slightly convex interorbital region $3\frac{3}{4}$ to $4\frac{1}{5}$,* diameter of eye $3\frac{2}{5}$ to $4\frac{1}{4}$ in the length of the head; snout much broader than long, very obtusely rounded in front, not depressed, as long as to as much as one-fourth of a diameter longer than the eye. Maxillary not reaching to the vertical from the anterior margin of the eye, its length $3\frac{1}{5}$ to $3\frac{4}{5}$ in that of the head. Ten gill-rakers on the lower branch of the anterior arch, all of them simple and tooth-like. The space between the origin of the first dorsal fin and the extremity of the snout is as long as or a little less than its distance from the base of the last soft ray; the fourth spine is the longest, $1\frac{1}{2}$ to $1\frac{3}{5}$ in the length of the head and reaching when laid back beyond the origin of the second dorsal fin in the ♂, $1\frac{1}{5}$ to 2 in the head and not reaching as far as the second dorsal in the ♀; in the ♂ the seventh soft ray is the longest, as long as the head, in

* $4\frac{4}{5}$ in one specimen.

beyond the vent in the ♂, shorter than the he
or not quite to the vent in the ♀: pectorals r
rays the longest, as long as or a little shor
ventral ray, reaching to or beyond the vertical
the second dorsal in the ♂, to beneath the dors
♀: caudal fin large and rounded, as long as
than the head; caudal peduncle shorter and
than in the female, as long as or a little shor
its depth $1\frac{3}{5}$ to $1\frac{2}{3}$ in the ♂, $1\frac{9}{10}$ to $2\frac{1}{10}$ in th
Genital papilla large and oblong, notched at th
is simple and passes along either side of the o
the ♂, double, papillose, and does not extend
fin in the ♀. All the scales imbricate, those
the opercle), throat, and anterior part of the
the others.

♂. Greenish-yellow, with the edges of the sc
nape, and belly orange; a purple spot on the
in the axil of the pectoral present or absent; d
orange, with a wide purple marginal band, t
teriorly with white spots, the extremities of t
caudal fin yellowish-gray with irregularly ana
microscopic spots; pectorals and ventrals gray

♀. Yellowish-green, the upper scales with
violet spot, which, when present, gradually
sides; below grayish-white; upper surface o
opercles gray, both more or less clouded wit

This handsome species can be at once distinguished from *compressus*, of which it is the southern representative, by its more elongate body, that of *compressus*, the type of which I have compared with my specimens, having a depth of $3\frac{1}{8}$ in the length, while the depth of the head is almost equal to its length; the same measurements are maintained in two examples from the Tweed River in the Macleay collection.

In 1867 Dr. Franz Steindachner described a species of *Carassiops* from Cape York, for which he proposed the name of *Eleotris brevirostris*,* and this northern form appears to approach more closely to the Sydney species than to Krefft's; in fact at a later page (325) of the same volume Steindachner himself confuses the northern and southern fishes by recording two examples of *brevirostris* from Port Jackson.

In the Annals and Magazine of Natural History (4) xv. 1875, 147, Mr. O'Shaughnessy states that the *brevirostris* of Steindachner is identical with the *compressus* of Krefft, but for the reasons given above, as well as on account of the larger scales of the former, I cannot agree with him.

Instead of uniting the different forms in a single species of extraordinary variability, I prefer, at least for the present, to recognise four distinct but closely related species of Carp-gudgeons, namely:—(1) *longi*, from the metropolitan district of New South Wales; (2) *compressus*, from the Clarence, Richmond, and Tweed River districts; (3) *brevirostris*, from the Mary River (Australian Museum† and ? Challenger—and Port Denison—Krefft—to Cape York,—Steindachner—and (4) *elevatus*, Macleay, from Port Darwin, North-western Australia.

I obtained nine examples of this handsome species from one of the waterholes on the estate of the Hon. Wm. Long on the 24th April last, and have much pleasure in dedicating it to that gentleman in remembrance of the pleasant afternoon spent at Chipping Norton.

* Sitzb. Ak. Wien, lvi. i. 1867, p. 314.

† Two small bleached specimens in very bad condition.

The difference in colour between the sexes is so marked that it was only when examining my specimens on the following day that I recognised the relationship; this is possibly more apparent during the spawning season than at other times.

The dark purplish ground colour which is so conspicuous a feature, in the males at least, of both *compressus* and *brevirostris* is entirely absent in *longi*, its place being taken by orange, and so brilliant is this colour that it was only with difficulty that I could persuade many persons that they were not Gold fishes. Curiously enough, a small specimen, which had evidently suffered from an accident in its youth, had partially reproduced the variety of the Golden Carp known as the "Telescope fish," the eyes being produced in front of the head.

The specimens measured from 82 to 100 millimeters and were all full of spawn.

The types are in my possession.

KREFFTIUS, gen.nov.

Eleotris, sp. auctt.

Body oblong, compressed posteriorly, the back broad and flat in front of the dorsal fins, rounded behind, head rather large, about as wide as deep, the snout moderate and but little depressed, mouth small and oblique, the lips fleshy, premaxillaries

l and anal fins divided to the base; ventral fins not in ct basally, inserted a little behind the root of the pectorals, i 5 rays, the fourth produced and filiform; pectoral fins ed, with 15 or 16 rays, the middle ones the longest; caudal inded, the peduncle strong. Genital papilla large, trian- n the male, oblong in the female. Scales large and adherent, of the tail not much larger than those of the trunk; head ly scaly, the snout naked; scales of the head and anterior n of the body cycloid, the remainder ciliated. Vertebræ + 15).

y m o l o g y.—Dedicated to the late Mr. Gerard Krefft, to belongs the honour of having first pointed out the differences n certain of the Eleotrids of New South Wales.

) e.—*Eleotris australis*, Krefft.

t r i b u t i o n.—Coastal region of New South Wales.

KREFFTIUS AUSTRALIS.

tris australis, Krefft, Proc. Zool. Soc. London, 1864, p. 183; astelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 384 879); Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 617 881); Ogilby, Catal. Fish. N.S. Wales, p. 36, 1886.

Striped Gudgeon.

D. vii, i 8. A. i 8. P. 15-16. Sc. 31-33/8-9.

y stout and moderately deep, the tail compressed. ı of head $3\frac{2}{5}$ to $3\frac{3}{4}$, depth of body $3\frac{3}{4}$ to $4\frac{1}{2}$ in the total ; head as deep as or a little deeper than wide, its width $1\frac{1}{3}$ that of the slightly convex interorbital region 4 to $4\frac{3}{4}$, er of eye $4\frac{1}{5}$ to $4\frac{2}{3}$ in the length of the head; snout much r than long, very obtusely rounded in front, not or but epressed, from one-tenth to one-third of a diameter longer ıe eye. Maxillary extending to or not quite to the vertical he anterior margin of the eye, its length 3 to $3\frac{2}{5}$ in that of ıd. Eight or nine gill-rakers on the lower branch of the r arch, the front ones reduced to spiny knobs. The space

back in the ♂ to, in the ♀ not quite to the or
dorsal; the rays of the soft dorsal increase in l
the last, which is $1\frac{3}{10}$ to $1\frac{2}{3}$ in the head, in the
fourth—rarely the fifth—which are $1\frac{2}{3}$ to $1\frac{2}{?}$
anal fin originates below the second ray of th
the penultimate ray in the ♂, the third or fourt
longest, as long as those of the soft dorsal: f
considerably longer than the third or fifth an
filament; in the ♂ it reaches well beyond the v
as the head, in the ♀ to or not quite to the
one-fifth less than the head: pectoral fin rou
rays the longest, reaching to or not quite to th
dorsal interspace, its length $1\frac{1}{6}$ to $1\frac{1}{3}$ in that of
fin rounded, $1\frac{1}{10}$ to $1\frac{1}{3}$ in the length of the hea
long as or as much as one fifth shorter than the he
2 in the length. Genital papilla large; lanceol
than the eye, and nearly twice as long as broad
truncated, much shorter than the eye, and not
broad in the ♀. Scales large, not larger on th
sides of the body; those of the head, nape, th
smaller, and with very delicate concentric str
with coarser longitudinal striæ; scales of the
and cheeks smaller than those of the occiput a

Upper surface rich brown or purple, pass
greenish-gold on the sides, gray below, all

orbit to the base of the pectoral and sometimes a second lel band to the axil; dorsal rays yellow, the spinous portion two series of spots, the posterior of which are chestnut; the portion with four or five series of subequal chestnut spots or a basal series of large and numerous small scattered spots; l fin violet, the rays with alternate transverse bars of white ow and chestnut spots; anal fin orange in the ♂, golden in with a broad lilac or gray marginal band; ventral fins violet, the outer borders white or golden; pectoral fins yellow ed with gray and with a basal purple band which is led by a conspicuous broad stripe of orange or gold, behind a more or less distinct dusky band may be present; a large spot in the axil of the pectoral and another at the root of idal present or absent.

description of the colouration given above is drawn up series of specimens taken during the breeding season, and nts, therefore, the nuptial dress of this fine species.

spective of any difference in colour—which indeed is a iatter of shade—an analysis of the above description shows ie male fish may at all times be distinguished from the by the two following characters :—

The shape and size of the genital papilla; and

The greater comparative length of the fin rays, especially f the posterior portion of the soft dorsal and the anal, and irth soft ray of the ventrals.

ddition to these, the caudal peduncle appears to be distinctly · and deeper in the adult male than in a female of the ize.

he metropolitan district these Gudgeons deposit their spawn the latter half of April and the beginning of May, and as s this important function has been completed they retire to winter quarters and do not again make their appearance the ensuing spring; during the intervening months they i quiescent and cannot be taken either by hook or net, but inable to say precisely whether they merely conceal them- under stones and snags or in holes in the bank or completely

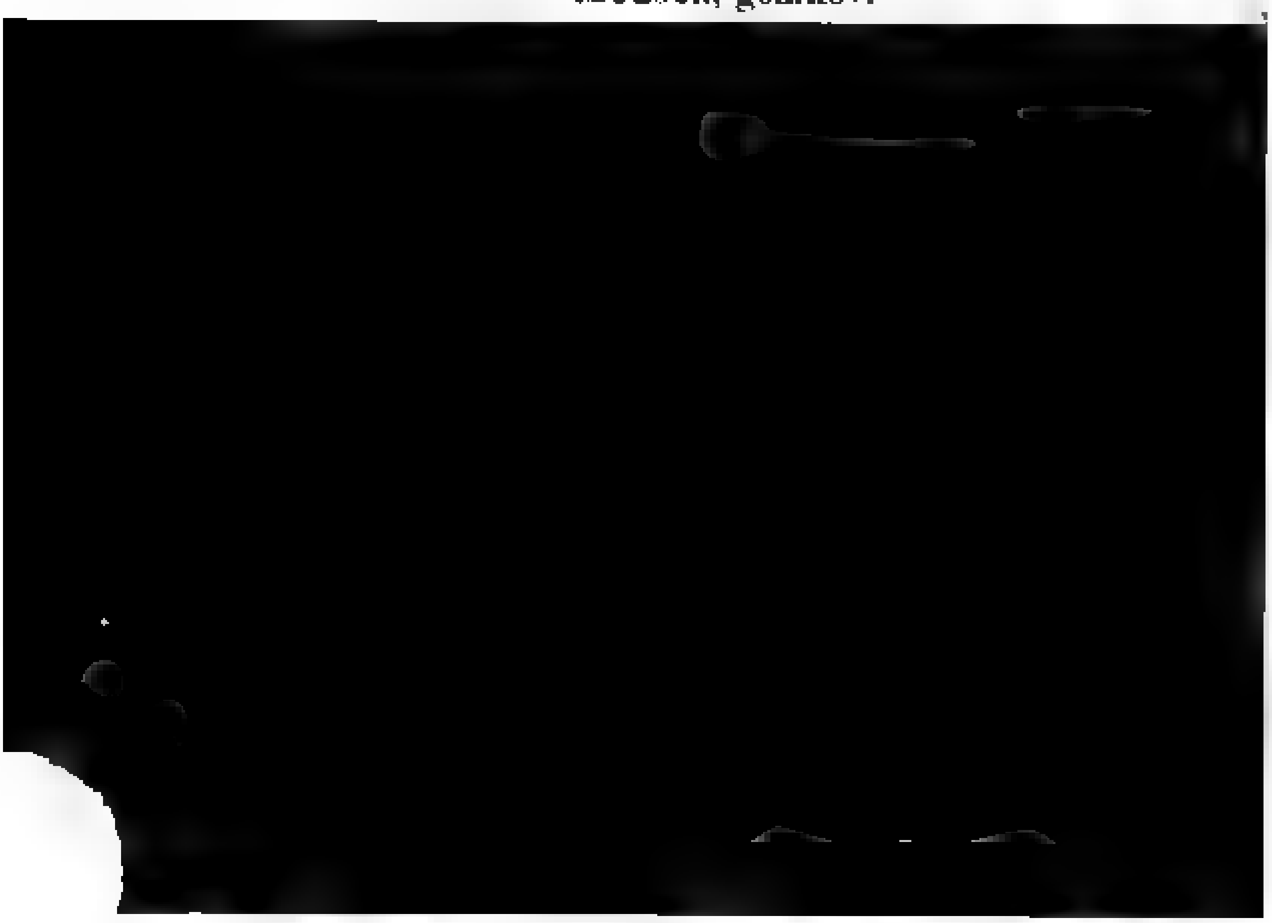
bury themselves beneath the mud; I am, however, inclined to believe that the latter is the true solution of their disappearance; that their abstinence, whether enforced or voluntary, has no ill effects on them is proved by the perfect condition in which they are when they reappear with the first warm weather.

Krefft's Striped Gudgeon is abundant in all the fresh waters in the neighbourhood of Sydney, and extends its range northwards at least as far as the Clarence River, from whence specimens were obtained by its original describer; it appears to prefer muddy waterholes and sluggish creeks to clearer and swifter waters, and is, therefore, more distinctly a denizen of the lower lands in the vicinity of the coast than is the next species.

My examples were taken from waterholes near Liverpool, in which I found them abundant, as also they are in the George's River above the weir. I have also examined specimens from the neighbourhood of Port Stephens, from Rope's Creek, from Cook's River, and from Nowra, as well as Krefft's types from Bronte and the Botany Swamps.

The largest of these examples measured 135 millimeters, and the description is drawn up from an examination of thirty-five specimens ranging from that size down to 63 millimeters.

MULGOA, gen.nov.



preopercle, the isthmus twice as wide as the interorbital region; five branchiostegals; pseudobranchiæ present, small; gill-rakers short, stout, and serrulate. Dorsal fins separate, with vi, i 8-9 rays, the spinous ones flexible; anal fin commencing well behind the origin of the second dorsal, with i 8-9 rays; the last soft ray of the second dorsal and anal fins divided to the base; ventral fins not in contact basally, inserted below the root of the pectorals, with i 5 rays, the fourth the longest, but not produced into crinoid filaments; pectoral fins rounded, with 18 or 19 rays, the middle ones the longest; caudal fin rounded, the peduncle strong. Genital papilla large, triangular in the male, oblong in the female. Scales moderate and adherent, those of the occiput about as large as those of the tail and a little larger than those of the trunk; head partially scaly, the interorbital region, snout, and anterior portion of the cheeks naked; scales of the head, nape, and throat cycloid, all the rest ciliated and finely carinated; head with numerous series of small pores. Vertebræ 28 (12 + 16).

Etymology.—Named after the district in which the typical species was first obtained and where it is abundant.

Type.—*Eleotris coxii*, Krefft.

Distribution.—Coastal region of New South Wales.

Mulgoa coxii.

Eleotris coxii, Krefft, Proc. Zool. Soc. London, 1864, p. 183; Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 618 (1881); Ogilby, Catal. Fish. N.S. Wales, p. 36, 1886.

Eleotris richardsonii, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 455, c. fig.; Ogilby, l.c.

Eleotris mastersii, Macleay, l.c. p. 622; Ogilby, l.c.

Cox's Gudgeon.

D. vi, i 8-9. A. i 8-9. P. 18-19. Sc. 37-40/11.

Body stout and moderately elongated, the tail compressed. Length of head $3\frac{2}{3}$ to $3\frac{9}{10}$, depth of body $4\frac{2}{3}$ to $5\frac{1}{2}$ in the total length; head as wide as or a little wider than deep, its width $1\frac{1}{2}$

to $1\frac{3}{4}$, that of the flat interorbital region $7\frac{1}{4}$ to $8\frac{1}{4}$, diameter of the eye 4 to $4\frac{3}{4}$ in the length of the head; snout much broader than long, rounded in front and slightly depressed, from one-tenth to two-fifths of a diameter longer than the eye. Maxillary not reaching to the vertical from the anterior margin of the eye, its length $3\frac{1}{3}$ to $3\frac{1}{2}$ in that of the head Eight or nine gill-rakers on the lower branch of the anterior arch, the last ones reduced to serrulate knobs The space between the origin of the first dorsal fin and the extremity of the snout is as long as or a little longer than its distance from the base of the last soft ray; outer border of the first dorsal fin rounded, the third or fourth ray the longest, $1\frac{3}{5}$ to $2\frac{1}{10}$ in the length of the head, and the last ray when laid back reaches in the ♂ to, in the ♀ not quite to the origin of the second dorsal; in the ♂ the fourth and fifth, in the ♀ the second and third rays of the second dorsal are the longest, $1\frac{2}{3}$ to $1\frac{3}{4}$ in the head: the anal fin originates below the third ray of the second dorsal; the sixth and seventh rays are the longest, as long as the soft dorsal rays: fourth ventral ray not reaching to the vent in either sex, its length $1\frac{1}{4}$ to $1\frac{1}{2}$ in the head: middle pectoral rays extending to the vertical from the origin of the second dorsal or not quite so far, their length in the ♂ subequal to, in the ♀ about one-fifth shorter than that of the head · caudal rounded, $1\frac{1}{10}$ to

mens are everywhere powdered with minute dusky dots; with or without a series of dark blotches; a similar series of or less irregularly arranged, often concurrent blotches t always present along the middle of the sides and ending large dark blotch at the root of the caudal fin, side of head ady with two oblique dark bars, the upper from the posterior angle of the eye to the axil of the pectoral, forming a picuous spot on the upper half of the base; the lower from snout along the inferior margin of the eye to the edge of the le, the interspace sometimes as dark as the bars, chin purple; sky blotch on the gill-rakers, dorsal fins, the first with a d orange to pale yellow or hyaline dark edged median band, second with two or three similar but narrow bands near the the outer half clouded with purple or violet; caudal yellowish n, closely ornamented with a network of more or less regular spots, anal stone-gray or vinous, tipped with violet, often the anterior ray brown and a median posterior golden patch, als violet or gray, sometimes washed with gold towards the pectorals olive-green, with or without a dusky shade on the r rays and with a more or less brilliant golden basal band. s golden brown.

a rule the more brilliant colours—the purple, blue, and ge may be taken as the prerogative of the male fish, but is not always the case, one or two females in my possession quite as brightly marked as their partners.

ll my specimens were obtained during the spring, and I cannot efore say whether any difference in colouration takes place g the breeding season.

his species has been exceptionally unfortunate in its describers; ft—who obtained his examples from Dr. James C. Cox—ibed them as having seven rays in the anterior dorsal fin; ype specimen, which came from the Mulgoa Creek, a tributary e Nepean River, into which it falls not far from Penrith, two others from Rope's Creek in the same district, still ing labels in Krefft's own handwriting, are fortunately in ence and possess six rays only in every instance; he also

describes the head as being scaly, which is misleading, as the greater part of the cheeks, the interorbital region, and the snout are naked.

Two years subsequently Dr. Franz Steindachner, in his description of *Eleotris richardsonii*, gives the number of rays in the first dorsal as seven in the letterpress, while in the excellent figure (unnamed and unnumbered) six are correctly shown; there is no other material difference between Steindachner's description and mine except in the comparative measurements of the interorbital region, the width of which according to him is greater than the diameter of the eye, while a reference to the above diagnosis will show that I make it much less at all ages; this, however, may possibly be explained by a difference in the system of measurement employed, the width in my descriptions always being that of the bony space only.

Finally Sir William Macleay, in diagnosing *Eleotris mastersii*, again falls into the same error, giving seven as the number of spinous dorsal rays; of the five examples labelled as above, now in the University Museum and undoubtedly the very ones from which Macleay took his description, not a single one has more than six rays. Rope's Creek, whence the types of *E. mastersii* were brought, is one of the original localities from which *E. coxii* came

overlapping in a kind of neutral zone which lies somewhere about the altitude of Penrith, where both species occur abundantly.

Besides the specimens enumerated above, I have to thank Mr. W. J. McCooey for three examples obtained in the neighbourhood of Camden; and more especially am I indebted to Mr. M. P. Gorman, of Burragorang, for three magnificent series forwarded during the months of October and November from the Wollondilly and "a small creek in the mountains away from the river altogether." These series are fully illustrative of the growth of the fish between the lengths of 33 and 138 millimeters, and the opportunity of examining them in a fresh condition has enabled me to thoroughly satisfy myself as to the identity of *richardsonii* with Krefft's species.

Fifty-three specimens have been examined in the preparation of this article, the largest measuring just 180 millimeters.

OPHIORRHINUS, gen.nov.

Eleotris, sp. auctt.

Body rather elongate, compressed posteriorly, the back broad and flat in front of the dorsal fin, rounded behind; head very large and strongly depressed, much wider than deep, the snout short and very obtuse; mouth large and but little oblique, the lips thin, premaxillaries but little protractile; maxillaries narrow, with the distal end exposed and linear; lower jaw much the longer; jaws with a broad band of cardiform teeth, all of which are fixed; lower pharyngeals forming together a subtriangular patch, armed with small, stout, hooked teeth, a few at the apex and along the symphysis somewhat enlarged; nostrils moderately separated, the anterior valvular; eyes sublateral; none of the bones of the head armed; gill-openings extending forwards to below or before the angle of the mouth, the isthmus about half as wide as the interorbital space; six branchiostegals; pseudobranchiæ present, small; gill-rakers short and rather slender, mostly serrulate. Dorsal fins separate, with vii, i 9-10 rays, the spinous ones flexible; anal fin originating behind the second dorsal, with i 9-10 rays; the last soft rays of the second dorsal and anal fins divided

to the base, ventral fins small, not in contact basally, inserted beneath or somewhat in front of the base of the pectorals, with i 5 rays, the fourth soft ray the longest, but not produced or filiform; pectoral fins large and pointed, with 18 or 19 rays, the middle ones the longest; caudal fin rounded, the peduncle rather slender. Genital papilla small. Scales moderate and adherent, those of the tail much larger than those of the trunk, entire head, except a portion of the occiput, naked; scales deeply embedded, cycloid and smooth in front, imbricate and feebly ciliated behind, muciferous system of head well developed. Vertebræ 30 (13 + 17).

Etymology.—ὄφις, a snake, ῥίν, snout.

Type.—*Eleotris grandiceps*, Krefft.

Distribution.—Coastal region of south-eastern Australia.

The following analysis will suffice to distinguish the two species here described:—

Width of head $1\frac{2}{5}$-$1\frac{2}{3}$, of interorbital region $4\frac{2}{3}$-$5\frac{2}{5}$, length of fourth ventral ray $1\frac{3}{5}$-$1\frac{3}{4}$, of caudal peduncle $1\frac{2}{5}$-$1\frac{3}{5}$ in the length of the head; inner series of teeth enlarged; 11-12 gill-rakers; scales 42 or less along the middle of the body

grandiceps, p. 746

Width of head $1\frac{4}{5}$-2, of interorbital region $5\frac{1}{2}$-$6\frac{1}{2}$, length of fourth ventral ray 2-$2\frac{2}{5}$, of caudal peduncle $1\frac{1}{4}$-$1\frac{1}{4}$ in the

to 6 in the total length; depth of head $2\frac{1}{10}$ to $2\frac{1}{5}$ (♂), $2\frac{1}{4}$ (♀), width of head $1\frac{2}{5}$ to $1\frac{1}{2}$ (♂), $1\frac{3}{5}$ to $1\frac{2}{3}$ (♀), of inter-region $4\frac{2}{3}$ to $4\frac{5}{6}$ (♂), 5 to $5\frac{2}{5}$ (♀), diameter of eye $4\frac{2}{3}$ to $5\frac{1}{5}$ length of the head; snout broad, rounded in front, and epressed, one-half to three-fifths of a diameter longer than

Maxillary extending to the vertical from the posterior of the eye (♂), the middle of the eye (♀), its length $\frac{6}{7}$ (♂), 2 to $2\frac{1}{4}$ (♀) in that of the head. The teeth of the eries are the largest, those preceding them growing y smaller. Eleven or twelve gill-rakers on the lower of the anterior arch. The space between the origin of the sal fin and the extremity of the snout is greater than its from the base of the last soft ray; outer margin of the dorsal convex, the second or third ray the longest, $2\frac{1}{3}$ to e length of the head, and reaching when laid back in the the ♀ not so far as the origin of the second dorsal; in he seventh and eight soft rays are the longest, $1\frac{1}{2}$ to $1\frac{3}{4}$, the third and fourth are the longest, $2\frac{1}{10}$ to $2\frac{1}{4}$ in the of the head: the anal fin commences a little behind the f the second dorsal and is in all respects similar to it: entral ray not greatly produced beyond the third or fifth nearly reaching to the vent in either sex, its length $1\frac{3}{5}$ to at of the head: middle pectoral rays the longest; they are much longer than the fourth ventral ray, reaching well the vertical from the origin of the second dorsal, and $1\frac{1}{4}$ the length of the head, in the ♀ subequal to the fourth ray, reach to or not quite to the vertical from the dorsal ce, and $1\frac{1}{2}$ to $1\frac{2}{3}$ in the head: caudal rounded, $1\frac{3}{10}$ to $1\frac{1}{2}$ ngth of the head; the peduncle rather slender, not differ. reciably in both sexes, its length $1\frac{2}{5}$ to $1\frac{3}{5}$ in that of the depth $2\frac{1}{3}$ to $2\frac{2}{3}$ in its length. Genital papilla very small ngular in the ♂, oblong and notched in the ♀, in which newhat larger. Scales small and irregular anteriorly; the tail with an angular border; occipital scales small, mbedded, and non-imbricate, extending forwards almost yes.

Pale reddish-brown above, yellowish below, the head darker, everywhere densely punctulated with blackish dots which are often concurrent, forming two more or less conspicuous series of dark spots, one along the dorsal profile, the other along the middle of the body, the latter terminating in a blotch which is always present at the base of the caudal fin; a pair of oblique brown bands from the eye across the opercles generally present, first dorsal pale yellow with a basal, median, and marginal dusky band; the second similar but with four or five narrower bands, caudal with about eight irregular transverse bars, which often form a network; anal and ventrals gray, with or without microscopic dusky dots; pectorals yellow, with a more or less faint darker basal band.

In the breeding season the upper surfaces, dorsal and caudal fins are deeply tinged with salmon colour.

I found this to be the most abundant species in the waterholes near Liverpool on the occasion of the visit above referred to, when, like the two other species obtained at the same time, they were busily engaged in the duties of reproduction. Subsequently I obtained a number of young specimens, under two inches in length from a waterhole at Camden Park, but failed to catch any adults.

The Flat-headed Gudgeon is an inhabitant of the coastal water-

v. 1880, p. 619 (1881); Lucas, Proc. Roy. Soc. Vict. (2) ii. 1890, p. 29.

hilypnodon nudiceps, Bleeker.

Yarra Gudgeon.

D. vii, i 9-10. A. i 9. P. 19. Sc. 43-47/12-13.

ly moderately elongate, tapering from the shoulder, the rongly compressed. Length of head 3 to $3\frac{1}{4}$, depth of body $5\frac{3}{5}$ in the total length; depth of head 2 to $2\frac{1}{4}$, width of head 2, of interorbital region $5\frac{1}{2}$ to $6\frac{1}{3}$, diameter of eye $4\frac{1}{2}$ to $4\frac{9}{10}$ length of the head; snout broad, rounded in front, and ately depressed, one-third to one-half of a diameter longer the eye. Maxillary extending to the vertical from the or third to the posterior fourth of the eye, its length $1\frac{9}{10}$ to that of the head. All the teeth are subequal in size. Seven e gill-rakers on the lower branch of the anterior arch. The between the origin of the first dorsal and the extremity of out is greater than its distance from the base of the last soft outer margin of the spinous dorsal gently rounded, the , third, or fourth ray the longest, $2\frac{3}{5}$ to $2\frac{3}{4}$ in the length of ead, and reaching when laid back nearly to, to, or a little d the origin of the second dorsal; the seventh or eighth soft re the longest, $1\frac{9}{10}$ to $2\frac{1}{3}$ in the length of the head: the n commences behind the origin of the second dorsal and is respects similar to it: fourth ventral ray but little pro- beyond the third and fifth, not nearly extending to the n either sex, its length $2\frac{1}{10}$ to $2\frac{2}{5}$ in that of the head: e pectoral rays the longest, reaching nearly to, to, or a little d the vertical from the origin of the second dorsal, and are $1\frac{3}{5}$ in the length of the head: caudal rounded, $1\frac{1}{2}$ to $1\frac{3}{5}$ in ngth of the head; the peduncle rather slender, its length $1\frac{1}{3}$ in that of the head, its depth $2\frac{3}{10}$ to $2\frac{3}{5}$ in its length. al papilla triangular in the ♂, oblong and crenulate in the cales small and very irregular anteriorly, some of those on il with an angular border; occipital scales deeply embedded on-imbricate, extending forwards beyond the preopercle.

pale grayish-green with four series of simi
caudal, anal, and ventral fins gray, sometim
of the rays violet; pectorals grayish-gree
darker.

This is the only Eleotrid which has as yet
from Victoria, nor so far as I know have
co-workers been more fortunate, though t
been recorded from the Yarra by Europe
cyprinoides by Klunzinger and *melbournens*

This Gudgeon is very abundant in the Y
be any doubt as to the identity of my spec
Castelnau; there are, however, several poi
need explanation, as follows:—

(1) In Castelnau's description the intero
be "one-third" of the length of the head,
only half that width:† this may be explain
to that suggested as the cause of difference l
description of *Eleotris richardsonii* and
(see p. 741).

(2) The apparently larger size of the e
easily capable of explanation by the fact th
ment of the length of the head is taken fro
projecting mandible, mine from that of the

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* It is one of the most remarkable problems c
fish literature how the continental naturalists r

ccording to Castelnau, "the head has no scales," but the occiput must have been overlooked by him, for though small and deeply embedded, they are nevertheless plainly

, however, are but minor discrepancies as compared with lentition; referring to this Castelnau writes—"the teeth extend on the vomer and the palatines; the posterior he tongue is also covered with them." This is quite the of what I find; in all my examples there is no sign of any part of the mouth except those on the jaws. If u's fish really had the subsidiary teeth attributed to it by iber – which on a review of all the facts of the case I may itted to doubt—it would of course be necessary to place ther genus; and this has possibly been already done by ker, since his *Philypnodon nudiceps* possesses the same a as that assigned to his species by Castelnau.*

lifferences which separate *grandiceps* from *nudiceps* are edly slight, but those which are noticed in the preceding (*see p.* 746) appear to be constant; the close affinity the two species was recognised by Castelnau, who writes: rincipal reason for not uniting my sort with Krefft's is, says that the pectorals attain the base of the anal; while ecimens they do not." I consider this elongation of the fins to be merely a sexual character.

ittle fish is abundant in the Yarra, along the banks of t is known as the "Big-head" according to Castelnau

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want of Bleeker's paper prevents me from ascertaining whether *Philypnodon* is founded upon Castelnau's description of *nudiceps*; the case, Bleeker's genus, being specially formed on account of a which it does not possess, must if monotypic be suppressed. And es another question to which I am unable to find a satisfactory namely--if a genus be founded on a character which is purely , should the name so proposed stand in preference to another characterised from the same species but at a later date? If the of forming new genera from descriptions only were discouraged or d, errors of this nature would soon cease.

(fide Lucas), who states that they are very voracious and feed on "fishes as large as themselves and generally of their own species."

Writing of this fish, Mr. T. S. Hall remarks (*in lit.*)—"It differs from Castelnau's *E. nudiceps* in the proportions of the head and especially in the teeth. Locality, "Yarra River at Melbourne (tidal)." Further on he says, "As a boy I have often caught what I imagine to be the same fish in the Barwon near Geelong in fresh water, and have seen a similar looking fish in the crater lake of Bullenmerrie, which is slightly brackish. I cannot vouch for the identity of the three forms. We used to call them 'bullies' or 'bull-heads,' and regarded them as poisonous." It is hardly necessary to say that the last supposition was erroneous.

My description is founded on an examination of sixteen specimens, ranging in size from 42 to 110 millimeters, for which I have to thank Mr. J. Kershaw, of the National Museum, and Mr. T. S Hall, of the Melbourne University, the latter of whom sent me no less than fourteen fine examples.

The type of *nudiceps* is not, so far as I know, in existence

In Macleay's Catalogue twenty-nine species of *Eleotris* are included among Australian fishes, but as, since the publication of the Supplement in 1884, this number has been nearly doubled from various sources, I append a list of all the species which have

australis, Krefft, Proc. Zool. Soc. London, 1864, p. 183; see p. 737 et seq.

brevirostris, Steindachner, Sitzb. Ak. Wien, lvi. i. 1867, p. 314.

butis, Hamilton-Buchanan, Fish. Ganges, pp. 57, 367, 1822.

castelnaui, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 620 (1881), = *obscura* (not Schlegel) Castelnau, Proc. Zool. & Acclim. Soc. Vict. ii. 1873, p. 134 (1874).

compressus, Krefft, Proc. Zool. Soc. London, 1864, p. 184; see p. 735.

concolor, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 692.

coxii, Krefft, Proc. Zool. Soc. London, 1864, p. 183; see p. 741 et seq.

cyanostigma, Bleeker, Kokos, iv. p. 452.

cyprinoides, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 248, 1837.

darwiniensis, Macleay, Proc. Linn. Soc. N.S. Wales, ii. 1877, p. 360 (1878) as *Agonostoma darwiniense*.

devisi nom. nov., = *cavifrons* (not Blyth) De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 693.

elevata, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 622 (1881) = *compressus* (not Krefft) Macleay, l.c. ii. 1877, p. 358 (1878); see p. 735.

elongata, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i. 1876, p. 334 (1877).

fusca, Bloch & Schneider, Syst. Ichth. p. 453, 1801.

gobioides, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 247, 1837.

grandiceps, Krefft, Proc. Zool. Soc. London, 1864, p. 183; see p. 746 et seq.

gymnocephalus, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 453 (1867); ? *Gymnobutis gymnocephalus*, Bleeker.

gyrinoides, Bleeker, Sumatra, ii. p. 272, 1853.

21. *humilis*, De Vis, Proc. Linn. Soc. N S. Wales, ix. 1884, p. 690.
22. *immaculata*, Macleay, Proc. Linn. Soc. N.S. Wales, viii 1883, p. 263.
23. *larapintæ*, Zietz, Rep. Horn Exped. Centr. Austr. Zool. p. 179, 1896.
24. *laticeps*, De Vis. Proc. Linn. Soc. N S. Wales, ix. 1884, p. 692.
25. *lineolatus*, Steindachner, Sitzb. Ak. Wien, lv. i. 1867, p 15.
26. *longi*, Ogilby, Proc. Linn. Soc. N S. Wales, xxi. 1896, p. 733 et seq.
27. *longicauda*, De Vis, Proc. Linn. Soc. N S. Wales, ix. 1884, p. 691.
28. *macrodon*, Bleeker, Bengal en Hind. p. 104, 1853.
29. *macrolepidotus*, Bloch, Ausl. Fisch. v. (pt. ix.) p. 35, 1795, not Günther, Fisch. Südsee, Heft vi. p. 186, which is *tæniafrons*; = *aporos*, Macleay.
30. *mastersii*, Macleay, Proc. Linn Soc, N.S. Wales, v. 1880, p. 622 (1881), = *coxii*; see p. 744.
31. *melbournensis*, Sauvage, Bull. Soc. Philom. (7) iv. 1880, p. 57.
32. *mimus*, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884. p 690 ? = *adspersus*.

nudiceps, Castelnau, Proc. Zool. & Acclim. Soc. Vict. i. 1872, p. 126 (1873); see p. 748 et seq.

oxycephala, Schlegel, Faun. Japon. Poiss. p. 150, 1850.

pallida, Castelnau, Res. Fish. Austr. p. 24, 1875.

planiceps, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 49.

porocephaloides, Bleeker, Sumatra, iii. p. 514; ? = *porocephalus*.

porocephalus, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 237, 1837.

reticulatus, Klunzinger, Sitzb. Ak. Wien, lxxx. i. 1879, p. 385 (1880).

richardsonii, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 455, = *coxii*, see p. 744.

robustus, De Vis, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 692.

selheimi, Macleay, Proc. Linn. Soc. N.S. Wales, ix. 1884, p. 33, = *planiceps* (not Castelnau) Macleay, o.c. vii. 1882 p. 69.

simplex, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 49.

striatus, Steindachner, Sitzb. Ak. Wien, liii. i. 1866, p. 452.

sulcaticollis, Castelnau, Proc. Linn. Soc. N.S. Wales, iii. 1878, p. 142.

tæniura, Macleay, Proc. Linn. Soc. N.S. Wales, v. 1880, p. 624 (1881).

tumifrons, Cuvier & Valenciennes, Hist. Nat. Poiss. xii. p. 241, 1837, = *ophiocephalus*, Macleay.

hree of the species included in the above list have so far been ıd on the opposite coast of New Guinea, but may confidently expected to occur on our northern shores; they are *butis*, *noides*, and *immaculatus*.

f the remaining forty-seven only six—*australis*, *coxii*, *grandi-*, *compressus*, *oxycephalus* and *mastersii*—were known to

Macleay as inhabitants of the rivers and estuaries of New South Wales up to 1884, when his "Supplement" was published, but two years later I was able to increase this number by four, adding *mogurnda*, *gymnocephalus*, *striatus*, and *richardsonii*; two of these however,—*mastersii* and *richardsonii*—I have shown in the foregoing paper to be identical with *coxii*, a third—*mogurnda*—rests its claim upon its inclusion by Steindachner in his "Fishes of Port Jackson (*Sitzb. Ak. Wien, lvi. i. 1867, p. 328*) and the authority of a single specimen now in the Australian Museum and said to have come from the Clarence River, and though this is very possibly correct, still in the lack of confirmatory evidence it is safest to look with suspicion on any record of its occurrence so far south: a fourth species—*oxycephalus*—I unhesitatingly reject: this is one of the fishes said to have been obtained by the collectors of the Novara during the short stay of that war-ship in the waters of Port Jackson, but which has never been found since it is a Chinese and Japanese species, and the improbability of its occurrence so far from its native shores is obvious.* With the addition of the new species above described and of *gobioides* included by Steindachner in his Port Jackson fishes,† this leave

* The following species, only recorded in the Fishes of the Novara,

New South Wales list with seven good and two doubtful ies, namely :—

1. Carassiops compressus.
2. Carassiops longi.
3. Krefftius australis.
4. Mulgoa coxii.
5. Ophiorrhinus grandiceps.
6. Gymnobutis gymnocephalus.
7. ? striatus.
?8. Mogurnda mogurnda.
?9. Gobiomorphus gobioides.

have been for some time past making special endeavours to n examples of *gymnocephalus* and *striatus*, but have failed so ı doing so, nor is either species represented in the collections e Australian Museum or the Sydney University.

e genus *Gymnobutis* was probably founded by Bleeker with dachner's *gymnocephalus* as the type; I am unable to suggest ıich of the recent genera *striatus* should be referred.

ON DOMATIA IN CER
OTHE

By Alex.

(Pl

Some years ago, when col
Miers, my attention was attra
on the upper surface of the le
nidus of some leaf-mining ins
showed that they always had
the leaf, and invariably occur
axils of the veins. A short ti
leaves of the ornamental Nev
commonly cultivated in gard
notice in this plant also the p
exterior by conspicuous pores
After this I began to exam
reach more systematically.

No books that I was able t
on the subject, and as I am d
make known my needs to se

röm's important paper on the subject* (with a copy of which e author most kindly favoured me subsequently). Also that oward (Illust. N. Quinologia) speaks of "the scrobicules or ands [in Cinchona], as Pavon calls them."

Mr. J. P. Hill sent me Geddes' "Chapters in Modern Botany," 1 p. 134 of which Lundström's views are mentioned. Mr. C. T. usson obtained for me the reference to Mr. Cheeseman's paper On the New Zealand Species of Coprosma,"† and so disposed of y doubt that New Zealand naturalists had failed to notice the ructures in question in plants of this genus.

Dr. Lundström was the first naturalist who systematically vestigated these structures. The following extracts from the mmary of it in the Journ. R. Microscop. Soc. (1888, p. 87) will fficiently indicate the conclusions at which he arrived in his luable paper.

"Domatia.—Dr. A. N. Lundström defines as 'domatia' those rmations or transformations on plants adapted to the habitation guests, whether animal or vegetable, which are of service to e host, in contrast to cecidia, where such habitation is injurious the plant. He describes these domatia in detail on the lime, der, hazel, and other trees and shrubs, and gives a very long t of species, belonging to a great variety of natural orders, on hich they are found.

"The principal types of shelter are as follows :—(1) Hair-tufts, ., in *Tilia europæa*; (2) recurvatures or foldings in various rts, *e.g.*, in *Quercus robur* . . . ; (3) grooves without hairs, in *Coffea arabica* . . . ; with marginal hairs, *e.g.*, *Psycho-ia daphnoides* . . . ; with basal hairs, as in *Anacardium cidentale* . . . ; (4) pockets, as in *Elæocarpus oblongus* . . ; (5) pouches, *e.g. Eugenia australis*. These different ypes of domatia are connected by transition forms. The habit f producing domatia in a species may become hereditary without e actual presence of the predisposing cause. Certain orders,

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* Nov. Act. R. Soc. Sc. Upsala, (3) xiii. (1887), pp. 1-72 (4 pls.).

† Trans. N. S. Inst. xix. 1886, p. 221 [1887].

They are most abundant and best devel
temperate) zones.

"In the second chapter the author di
various interpretations which may be put
They may be pathological, like galls; (2) the
insects; (3) they may have only an indi
their tenants, (4) they may be of use to the
of commensals. He adopts the last interp
an interesting parallel, however, between ga
is inclined to suppose that the domatia wer
by the insects, but have gradually become
characteristics. The author gives a clear
the cecidia or galls due to 'antagonistic sy
or animal, (phyto- and zoo-cecidia), and do
symbiosis,' either plant or animal (phyto- and
due to plants are again subdivided into my
or -domatia."

Mr. Cheeseman's remarks are very interes
his paper was published in the same year (
but also because he, too, noticed that the
were often tenanted by Acarids. He says
species except a few of the smaller-leaved o
exist on the under surface of the leaves, in
the union of the primary veins with the mi
more than $\frac{1}{8}$ of an inch in length, and a
Inside they are lined with numerous stiff

ndström, quite reasonably. expresses surprise that domatia attracted so little notice. And hardly less remarkable is it ıp to the present time, the text books have still nothing, or tle to say about them or their significance. Nevertheless, vere long ago noticed in at least one Australian plant, but g been relegated to the category of "glands"—"that word ny meanings," as De Bary remarks—their nature seemed to ıked upon as settled. For example, in Vol. li. of Curtis's ical Magazine, published in 1824, there is a figure (Pl. 2488) *sus* [*Vitis*] *antarctica* [= *V. Baudiniana*, F.v.M.], in which ia are distinctly shown, while the text mentions "foliis laxe serratis glabriusculis subtus glandulosis." The ymy also shows that at a still earlier period Poiret, because presence of these supposed glands, had described the species the name of *C. glandulosa*, "foliis ovatis glabris laxe o-serratis nervis basi glandulosis."

1879, at a Meeting of the Linnean Society of London, R. Irwin Lynch directed attention to a growing example Kew Gardens, and some of the dried leaves of *Xanthosoma liculatum*, on the under surface of which peculiar pouch-xcrescences emanate from the midrib. This pseudo-rosity is of remarkably constant occurrence."* If these cences be, as I think they are, domatia, the plant (an ı is remarkable as being the only instance known of the ence of domatia in the Monocotyledons. Mr. Lynch, too, is rst, apparently, who saw anything uncommon in the ıres.

ew other references to what would now be called domatia e given.

nen says of *Psychotria bisulcata*, "Lateral veins often with eep pits in their axils, which appear as warts on the upper e." ("Handbook of the Flora of Ceylon.")

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* ırn. of Bot. April, 1879, p. 125, but not noticed in the Proceedings Society.

second group is thus described: "Folia . . rotundatis, subtus concavis, marginibus nentibus, ad nervorum axillas insertis, s subtus dilute." . . . "This is a hairy all over, especially on the under-sic position of these so-called glands in the appearance in the figures, I have no dou domatia. Among the species spoken of *viridifolia* is described as "At nerve-ax which is one of the forms of domatia. (*glomerata* are mentioned as hairy. This is strom's experience: his opinion being that d hairy-leaved plants.

A doubtful species of *Calisaya* knowr spoken of by Howard as having "scrob axils of the veins, but also at their junct veins, as in *Olea scrobiculata*." The accom very distinct domatia, which are visible on (Journal of Botany, 1869, p. 3.)

Of *Cinchona Ledgeriana*, Trimen says: spicuous, mostly confined to the upper ve Botany, 1881, p. 323.)

Martius in the "Flora of Brazil" refers several descriptions of the leaves.

Hooker says of *Elæocarpus dentatus*, "w

); the leaves of *Vitis oblongata* "with two large glands
ı in the axils of the lateral veins": the leaflets of *V. ster-*
with glands or foveoleæ in the axils of some of the
eins underneath" (*ib.* p. 450). He also mentions
on the leaves of *V. Baudiniana.*

 G. de Lagerheim has described some new acaro-
) in *Solanum jasminoides* and *S. pseudoquina,* and he
ıe descriptions in De Candolle's Prodromus as evidence
other species being domatia-bearing : he also discusses
ı of domatium in some plants of the genus *Cestrum.*

part of the observations recorded below were embodied
read at the Meeting of this Society in November, 1895,
:his time I was not aware of Lundström's paper, I was
withdraw it for the purpose of re-writing with a know-
ıat author's work.

ıatia that have come under my notice consist of hollows
er surface of the leaf, and always occurring in vein
ey are usually roofed over either by an extension of the
, or by hairs. They are distinguished by peculiarities
ute structure of the part of the leaf lying over them.
t are known to me I divide into groups according to
ard structure as follows :—

.—Circular lenticular cavities on the under side of the
with a small opening and a thickened rim. Those
Pennantia Cunninghamii present the highest develop-
ıis type which I have seen.

i.—Pouches formed by a widening of the principal and
ns at the axils, the space being filled in with tissue so
a triangular pouch or pocket. To this group belong
a in *Dysoxylum Fraserianum.*

iii.—Depressions or hollows formed by a thinning of
bstance at the axils. Of this type *Viburnum chinense*
he best example.

v.—Bunches of hairs in the axils proceeding from the
nd secondary veins, such as are found in *Rubus Moorei.*

entirely absent. A regular gradation may
these forms, and it is sometimes difficult to
a particular domatium should go. I think t
is the most natural, for as will be seen it is
consecutive steps in the development c
*Pennantia.**

Group. i.

PENNANTIA CUNNINGHAMII, Miers.—In
probably reach their highest development
commonly at the first axils of the secondary
times to be found in the axils of the princi
and very often on the ramifying veins at jur
vary from 9 to 50, and I have counted mor
two leaves. They are very constant in oc
time ago I found two plants on opposite
within a few yards of each other, in one of
upwards of 30, while many on the other
majority only a few. But this was the on
hundreds which I examined that was in
recently visiting these plants, I find that al
the plant formerly without domatia have the
and perfect in development on the mature le

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* Since completing this paper I have observed i
(Acanthaceæ) rows of white hairs with crimson

that the absence of cavities in some species is a by no means uncommon occurrence, and Lundström and Lagerheim note the same fact.

The upper surface of the leaf is extremely glossy and dark green; the under side is duller and lighter in colour. When dipped in water, the upper wets readily, while the water gathers in patches on the under side, as if it were greasy. The pits appear on the upper surface as very distinct, though small, domed protuberances, circular or elliptical in outline (fig. 3); they are flatter on the under side (fig. 2). They vary in size in mature leaves from 1 to 3·5 mm. in diameter (outside measurement), and the depth is usually two-thirds of the diameter. The opening is small and usually circular, and in the largest about ·75 mm.; it is surrounded by a thickened rim in which are vascular bundles proceeding from the veins between which it occurs; the rim is lighter-coloured than the rest of the leaf. The interior is usually lined with 1-celled hairs. Stomates occur plentifully on the lower side of the leaf, but they are absent in the domatia and on the upper side of the leaf. The pits are often inhabited by minute Acari, and their ova and excrement are also found in them. The mites sometimes quit the cavities and wander about on the under surface of the leaf. I have also seen similar Acari in the stomatal cavities of *Banksia*, in the rolled leaves of *Ricinocarpus*, &c., and in any other cracks or cavities suitable for shelter in plants.

The microscopic examination of sections of the domatia cut at right angles to the midrib and vertically, as regards the blade of the leaf, shows the structure described below, which is pretty constant in all the domatia I have cut. Beginning at the upper surface of the leaf, *i.e.*, on the upper leaf-surface there are—

(1) The cuticle, which is thin (fig. 5*a*).

(2) An epidermis composed of one layer of small oblong cells (fig. 5*b*).

(3) A single layer of hypodermal cells (5*e*) much larger than those of the epidermis, and from elliptical to oblong in shape, with thickening at the angles. These cells are very thick-walled, and

in other parts of the leaf have little protoplasmic contents; but over the dome they are richer, and often contain chloroplasts. From their varying appearance in leaves of different ages I believe this layer is derived from the next below.

(4) The palisade-tissue (5*d*) consisting of two rows of short oblong cells, their long diameter being horizontal instead of vertical. These cells contain many (up to seven) very large chloroplasts.

(5) A layer of spongy parenchyma (5*f*) containing also very large chloroplasts. In this particular region this tissue can scarcely be termed spongy, as it is composed of oblong cells laid over each other like bricks in a wall; but away from the summit the cells are branching and form the usual network, and the most open part lies all round the perimeter of the cavity. The dense layer over the roof is characteristic of the domatia in all the plants I have examined In the lamina, at a short distance from the cavity, the intercellular spaces are arranged perpendicularly, and extend from the lower epidermis to the palisade-tissue above, the stomata opening as usual into the spaces. All through the leaf in this region there are cells not to be distinguished in a fresh section, but which stain very deeply with any stain, and more especially with hæmatoxylin, they become quite opaque before the rest of the section is sufficiently stained (5*e*). These cells are

(7) The inner cuticle (5*h*). Through this penetrate unicellular irs (fig. 10) which are epidermal outgrowths, and are thick-lled and destitute of contents. They are rarely septate as own in the figure, but usually resemble those of *Coprosma lucida* ;. 11). This cuticle, as above remarked, has no stomata.

The same layers, omitting the palisade-parenchyma, are met h in the floor of the cavity, but in reversed order, and in the i is a vascular bundle composed of five or six vessels.

On examining leaves of various stages of growth, I find that in res 5-9 mm. in length, the domatia appear as slight hollows. leaves 1-9 cm. long I find the hollow deeper, and a little tuft of rs in the angle. These are of two kinds: the ordinary pointed r (fig. 10) and short thick ones composed of four almost oular cells. In a leaf of 4 cm. long a thickening is apparent ng the sides of the veins, making a triangular pocket as in oup ii., and the hairs project from this. At 5 cm. long the ckening begins to extend across the mouth from the sides, so t there is a hollow surrounded by a ridge. Up to this stage whole of the under side of the leaf is a purplish-brown in our, but the ridge is a very bright green. The ridge had wn higher all round in leaves 5-5 cm. long, and a few hairs grown on the front part of the ridge, their points directed ards the centre of the hollow. In leaves 6 cm. long the greater ght makes the cavity appear much deeper. At 8 cm. the ridge reached its full height, and there are a few hairs on the out- of the ridge—simple and pointed. The domatia are com-tely formed when the leaf is 11 cm. long, and no further ration takes place except that in leaves a year old there are er hairs in the interior of the domatium. The leaves reach a gth, when full grown, of 16 cm. and upwards. In examining a ge series of young leaves, I found no Acari present until the natium was fully formed. This fact has an important bearing Dr. Lundström's theory of the meaning of the structures.

COPROSMA LUCIDA, Forst.—This plant also belongs to Group i. domatia are very large and highly developed. They occur the axils of the secondary veins and midrib, in pairs, or

alternately. They vary in number from 3-8. They rarely occur in the forks of the secondary veins. The leaf is very dark green, and has a varnished upper surface; it is lighter in colour and duller below. It wets readily on the upper side, but is greasy on the under side. It is very thick, fleshy and soft, and the rim of the cavities does not project beyond the veins as in *Pennantia*. They show above as slight rounded projections and have a round orifice below, surrounded by a slightly thickened rim, the thickening being internal. Internally they are lenticular, 2-3 mm. in external diameter and the opening ·5-1 mm. The interior cavity is proportionately smaller than in *Pennantia*. The rim is lighter in colour than the rest of the under surface. The interior is lined with thick-walled unicellular hairs (fig. 11), and hairs of the same kind occur on the midrib below, sparsely on its upper surface, and very plentifully in the channel of the petiole in young leaves. A section of the cavity perpendicular to the plane of the leaf and across the axis of the cavity shows the following structure, beginning on the roof—the upper surface of the leaf:—

(1) The cuticle.

(2) The epidermis, composed of one layer of small elliptical or oblong thick-walled cells.

(3) A single hypodermal layer of oblong cells with thickened walls, and almost always without protoplasmic contents.

(4) The palisade-parenchyma, made up of four or five rows of oblong cells little longer than wide, and very rich in chromatoplasts, sometimes as many as 20 lining a single cell.

(5) A thick layer of spongy parenchyma, arranged in a network, t very closely, and with few intercellular spaces, and these ry small. The cells of this layer are small. At the sides of cavity they are larger and looser in arrangement, so that the imeter of the cavity is surrounded by this more open network of ls, which gradually passes into the ordinary spongy parenchyma the rest of the leaf. Here the intercellular spaces are regularly anged, and extend from the lower epidermis to the palisade-ue. These cells also have very many chloroplasts, and those rest to the palisade cells have the oil globules above mentioned. there are none of the tannin-sacs noted in *Pennantia*, and in densest part they are never arranged like brickwork as in species.

) A single layer of epidermis, the cells thick-walled, and the ity circular in outline. From this proceed the unicellular k-walled hairs springing from much enlarged cells, and some-es but rarely septate.

7) The cuticle of the inside continuous with that of the lower of the leaf. No stomata occur in the cavity, but they are nd up to the very margin of the orifice. Vascular bundles ur in the spongy parenchyma all round the cavity.

n the floor of the cavity all these layers except the palisade-ue and the hypoderma occur in reversed order. The develop-nt of the domatia in young leaves takes place much as in *nantia*, but the unicellular hairs appear later, only the 4-celled rs being present at first.

The points of resemblance between *Pennantia* and *Coprosma* the dense spongy parenchyma over the roof and round the ity, and the epidermal hairs inside and at the mouth. The erences are the occurrence of tannin-sacs in *Pennantia* and not *Coprosma*, and the non-occurrence of oil globules in the cells, l of hairs on the outside of the leaves in the former.

COPROSMA FŒTIDISSIMA, Forst.—I have seen dried leaves only this and the following seven species, and am not able therefore give particulars of the minute structure. In this species the natia are in the axils of the second and third pairs of veins

C. Cunninghamii, Hook. f.—The domat
wise like those of *C. lucida*.

C. spathulata, A. Cunn.—As might b
small size of the leaf, the 2-4 domatia are v

C. Baueriana, Hook. f.—Dr. Lundström
vation of cultivated plants, says that the d
are hairless. I find that my notes afford no
hairs are present in the herbarium specimen
simply noted that they resemble those of C

C. grandiflora, Hook. f.—The domati
openings slits parallel to the midrib.

Canthium lucidum, Hook. et Arn.—The
axils of the second pair of veins and the m
up in the forks. They are two in all I
Betche informs me that they are often enti
is a very glossy one. The openings are cir
diameter, the rim is raised and light-coloure
it. So far as I can see there are no hairs p

C. oleifolium, Hook. The leaf is evide
'Handbook of the Flora of N.S.W.' is
shining." The pouches are situated in the
second pairs of veins and midrib, and are s
are 4 in number, but as in the preceding sp
The opening is triangular or circular, and
and contains vessels. No hairs were seen i

Randia Moorei, F.v.M.—The domatia

(1) The cuticle, which does not differ from that elsewhere on the leaf.

(2) A thick-walled epidermis, the cells often containing protoplasm.

(3) A row of bottle-shaped cells, of very large size, arranged touching each other at their large ends, but with spaces between the necks, which point to the mesophyll (fig. 14*a*). This occurs over all the leaf.

(4) The palisade-tissue which fills in between the necks of the bottle-like cells and below them. This is moderately dense, and the cells full of chloroplasts.

(5) A layer of close spongy parenchyma, which in all parts of the leaf is penetrated a little above the lower epidermis by

(6) A layer of thick-walled apparently empty cells (fig. 14*b*), which stain very deeply, and are, I think, 4-armed, as whether sections are made parallel, or at right angles to the midrib, cut ends are seen, circular and thick-walled. Both these and the bottle cells give a bright purple with ferric chloride, and are most likely tannin-sacs as in *Pennantia*. In fresh sections both kinds of cells are transparent and colourless, but in old spirit specimens they are bright brown. This layer divides in the same way as that in *Pennantia*, one part going to the roof and the other to the floor of the domatium. Those above are of normal size, while those below are smaller and more scattered.

(7) The epidermis resembling that of the upper surface.

The roof and floor of the domatia are irregular, almost papillose, and stomata occur in great numbers on the elevations. Vessels are present in all the walls.

R. STIPULARIS, F.v.M.—The leaf is very large, thick, fleshy and shining, and has very thick veins. The cavities are small and closely covered inside with hairs like those of *Coprosma*. These all point towards the orifice, so that looking down into it a close mat of points fills up the opening. This last is small and elliptical. The epidermis is thick-walled; the palisade-parenchyma is composed of 5 or 6 rows of small oval cells closely packed; the spongy

parenchyma is also composed of oval cells, with small and few intercellular spaces. The hairs have an enlarged cell at the base and are thick-walled and destitute of contents.

R. CHARTACEA, F.v.M.—In herbarium specimens imperfect domatia, and bunches of hairs were seen in the axils of midrib and secondary veins, but fresh leaves showed no sign of them. I cut sections through the axils and found a few minute hairs, but no approach to the characteristic structure described in the foregoing species. I was struck, however, by the packing of large collenchyma cells on the upper side of the midrib and veins. These stained very deeply, and when tested with ferric chloride gave the same purple reaction as *R. Moorei*.

MORINDA JASMINOIDES, Cunn.—This is a climbing plant. The cavities are usually high up in the axils of the third pair of veins and midrib. They are opposite or alternate. There are from one to four, but are sometimes absent. The leaves are rather thin, dark green, but not very glossy. The domatia project very much on the upper side of the leaf, and but slightly on the lower. They are very large, and look like blisters or galls externally. They vary from 1-5 mm. long. The openings are sometimes of the full size of the cavity, but usually they are small and circular. There is sometimes a ridge parallel with the vein, thus forming a channel leading to the orifice. The rim is slightly thickened and lighter-coloured than the rest of the leaf. Many vessels occur in it and in the leaf. Ordinarily there are no

pidermis taken together are as thick as, or thicker than the layers between. The epidermal cells are very clear and free from contents.

(3) The palisade-parenchyma composed of two rows of very small oblong cells. the inner row smaller and rounder than the outer and very closely packed.

(4) A very dense spongy parenchyma, becoming more open near the domatium. Both this and the palisade layer are very dense all through the leaf and very full of chlorophyll bodies, so that it is difficult even in the thinnest sections to make out the structure. I found hydrate of chloral most useful in clearing the sections.

(5) The epidermis of the domatium, in two layers, the inner composed of larger cells.

(6) The inner cuticle, through which stomata open in all parts of the cavity. The same layers occur in reverse order in the floor, nd running from the midrib and vein is an extension of the ound strengthening cells which occur outside these.

The above is a description of the domatium in an ordinary ealthy state. I have rarely seen Acari in them. But some ime ago I came across a plant with very large domatia which 'ere evidently in an unhealthy state, being pale or brown, or ven black. On examining them, I found that all the unhealthy omatia contained numbers of Acari and their ova. Sections of hese showed the palisade and spongy parenchyma cells greatly wollen and very irregular in shape, and undistinguishable from ach other. Brownish patches occurred here and there, and also n places a number of cells had taken a bright crimson colour. n some of the cells of the mesophyll there was a deposit of ranular matter on the walls. The epidermal cells were normal s to shape, but even larger than ordinary. Where ova rested n the interior of the domatium, the cells were dark-coloured and ry closely placed. At the mouth, hairs of the same kind as in *nantia* were placed. In three sections from the same domatium counted ninety-two ova, besides several young and mature Acari.

The mites were the same species as are usually found in domatia. They appear to be very near, if not identical with, the *Gamasus* figured by Lundström. There could not be any doubt but that the mites had an injurious effect, and this, with another case to be referred to, was the only instance I have seen of the little animals being hurtful to the plant. But there was no sign of the peculiar alterations and structures which are caused by *Phytoptus* and some other noxious mites.

TARRIETIA ACTINOPHYLLA, C. Moore.—The leaves are digitately compound, and when young are studded with star-shaped peltate hairs, especially on the midrib. The domatia are in the leaflets in the axils of the secondary veins and the midribs. They do not occur in the lower part of the leaflet nor near its tip. In the same leaflet some veins are in pairs opposite, and others alternate; the domatia thus are in pairs or single. In three leaflets examined by me there were 14, 15 and 17. The leaf is strong in texture and smooth, shining on the upper surface, but not varnished. It wets readily on this side, but on the lower surface the water runs together and passes down the vein channels; it does not, however, enter the domatia, as the orifice is too small. The pits are formed by a widening of vein and midrib running out towards each other and almost meeting in the centre (fig. 15), thus forming a depression leading into the domatium. Sometimes, however, the ridges

3) The palisade parenchyma, consisting of long cells, arranged wo ayers, and very full of chloroplasts.

) The spongy parenchyma, denser here than elsewhere in the but yet more open than in *Pennantia* or *Coprosma*. It has er of tannin sacs, but not very rich in tannin

) The inner epidermis, thick-walled and with brown contents.

) The cuticle, through which project hairs, without stomata. loor has cuticle, epidermis, spongy parenchyma (denser than in the roof), epidermis, and outer cuticle The stomata in ower epidermis extend to the very edge of the mouth.

e brown contents of the epidermal cells are found all over eaf, and appear solid and squarish in outline. The hairs of omatium have also brown contents, often broken up so as to ble a string of beads.

EX LITTORALIS, Forst Mr E Betche discovered that the rium specimens of this plant in the museum of the Sydney nical Gardens, collected in New Zealand by Mr T. Kirk, well marked domatia, but on examining the growing plant e gardens none could be seen. Many domatia bearing s show this inconstancy, but I have not been able to trace use. It must be remembered, however, that young leaves nothing but the depression in the angle, to the naked eye, en to the hand lens In this way I think it happened that nt of *Hodgkinsonia* to be referred to was recorded as being ut these structures. From the above causes I am compelled eak only of dried material of this species. The opening is ar, the rim very much thickened, and the domatium projects d the surface of the leaf both above and below. They are d in the main axils and are 4-8 in number I attempted ns after prolonged soaking in glycerine with a little spirit, ucceeded in cutting them fairly thin, but the cells were much ted, and I could only see that the arrangement of layers bled that in other plants, and that there were no hairs in vity or round the orifice

CHOTRIA CARRONIS, C Moore, et F v M —I have seen only rium specimens of this plant. The domatia occur in the

main axils and are very large,
could see no hairs present anyw

P. CYMOSA, Ruiz et Pav.—Tl
axils and have a circular ope
resembles that of *Coprosma luc*
of palisade-tissue composed of
phores. The hairs are differen
thirteen divisions (fig. 9). The
There are no stomata in the ca

P BISULCATA, .—I l
indebted to Mr. E. Betche for
says of the leaf, "Lateral vei
axils, which appear as warts o

The above-mentioned plants
highly developed form of doma
a large number of other species

Gr

DYSOXYLUM FRASERIANUM,
principal axils of the leaf or lea
form never occurs in the secon
on only one side of the midrib,
in number from one to twelve.
a shady situation are very dark

than any I have seen in other plants, (4) close spongy parenchyma, (5) epidermis, and (6) cuticle. Here and there in the spongy parenchyma occur spherical interspaces of large size and destitute of contents. In the diseased looking domatia of great thickness I found that the spongy parenchyma layer was of greater thickness, the hairs absent, and the roof and floor epidermal cells filled with a red substance which formed a thick layer on both roof and floor. I fancy that this diseased state is caused by some insect (not a mite), taking up its abode in the domatia as I repeatedly found remains in sections of some rather large insect. The mites were found in a few of the domatia, and in all the domatia were found dust, pollen grains, and both spores and mycelium of fungi. It is rather remarkable that these should be so plentiful, as from the mouth opening towards the apex of the leaf, and the leaf itself having a horizontal position, they could scarcely be washed in by rain, especially as they are on the under side of the leaf. I did not find such quantities of foreign matter in any other domatia, even of those with orifices as large. But Dr. Lundstrom notes the same kind of thing in many species examined by him.

Cedrela australis, F.v.M. The domatia are like those of the last plant, but flatter, stomata occur in the inside and there are none of the spherical intercellular spaces mentioned above.

In very young leaves (10 x 1.5 mm.) the under side of the leaf is covered all over with hairs, as the leaf grows older, the hairs drop off, except those in the axils where domatia are to form. The hairs are of two kinds, pointed and thin, and short 4-celled ones filled with bright brown matter. These persist for some time on the general leaf surface, and in the axils. They are probably colleters. In a leaf 10 x 3 mm. I found the hair tufts and a slight widening of the veins in the axils, and in larger sized leaves the tissue widens progressively. But the domatia have not reached their full development even when the leaf is full grown as to size. It is only when the leaf has gained its mature hardness and consistency that the process of growth in the domatia is complete.

rching of the tissues. There is also sometimes a closed-1 cavity on each side of the domatium. This I have seen in *Morinda jasminoides* also. The domatium is 2 mm. gh, and the transverse measurement 2·5 mm. in large specimens. e interior is thickly lined with thin cottony hairs, and there besides stalked T-shaped hairs (fig. 8). Stomata are found ly in the lower epidermis, and do not extend to the cavity. I re often found in the domatia small hemipterous insects, which parently are in the habit of frequenting the cavities, for when ven out of one they go straight to another.

The microscopic structure is much like that in *Dysoxylum*. palisade-cells occupy half the thickness of the leaf. There o thickening or thinning of the leaf blade at the domatium, it curves upward slightly, showing a slight protuberance on upper surface. Vessels occur in the domatium walls. It is icult to make out the domatia in young leaves on account of thick felty layer of hairs. But even in the bud stage I could ke out that the tissue extension is present. I have not seen is so early in any other plant.

Group iii.

VIBURNUM CHINENSE, Hook.—The depressions are large and cur in the axils of midrib and veins. They are 6-14 in number. e leaf is thick in texture, light green, but not glossy. The pression is formed by a thinning of the leaf substance, and has ping sides and an irregular surface. There is a slight thicken- of the leaf all round the hollow (fig. 13), and on this and the vations are tufts of light brown and curled hairs. They are ck-walled, and their contents are arranged in globules like a ng of beads. On the thinner veins where there are no domatia w rows of straight hairs grow. The hollows are about 2 mm. liameter. Stomates occur on the lower surface of the leaf and he hollows. The minute structure is as follows:—(1) Cuticle; epidermis of the upper surface with thick walls; the cells taining a considerable amount of light green chlorophyll; (3) isade-tissue very full of large chromatophores, passing gradually

into (4) a very loose spongy parenchyma also rich in chlorophyll, the cells large in size, and staining deeply; (5) a thick walled epidermis sometimes having brown contents as in *Tarrietia* out of which grow the hairs, two, three or more hairs springing from one cell (fig. 13); (6) the cuticle with stomata.

SLOANEA WOOLLSII, F.v.M.—The depressions are in the axils of the midrib and laterals, and begin at the lowest pair. They number 15-21, and are minute—1 mm. in diameter. The leaf is hard in texture and smooth; it wets readily above, but on the under side the water runs into patches. There is not such a decided thinning of the leaf as in *Viburnum*, but the thickened rim runs all round, and few hairs grew on this. Stomata are found on the under surface, but, so far as I can see, none extend to the hollow. The microscopic structure is as in the last-named species, except that there are no deeply staining cells, and the spongy parenchyma becomes very dense over the roof.

GARDENIA sp.—In a commonly cultivated species of this plant I found depressions filled in with long straight hairs springing from the vein and midrib: they are roughened on the surface, septate, and have green or brown contents at the tip. Stomata occur in the pit.

Group iv.

Examples are seen in *Hydrangea hortensis*, Sieb., *Morinda citrifolia*, Linn., and *Mandevillea* sp. hort. There is nothing resembling the microscopic structure of the cavities, etc., to be seen in these. The cells from which the hairs spring in *Mande*

I have described the domatia of the above-named species fully types of the structures in question. The following list of natia-bearing plants which I have myself examined is arranged ording to Natural Orders. I have followed Baron von Mueller's ingement in the Second Systematic Census of Australian nts.

MELIACEÆ.

Dysoxylum Fraserianum, Benth.	ii.
Synoum glandulosum, A. de Juss..	ii.
Cedrela australis, F.v.M..............	ii.

STERCULIACEÆ.

Tarrietia actinophylla, C. Moore	i

TILIACEÆ.

Elæocarpus cyaneus, Ait.	ii.
grandis, F.v.M.......................	ii.
obovatus, G. Don......	ii.*
Sloanea Woollsii, F.v.M......	iii.

SAPINDACEÆ.

Diploglottis Cunninghamii, Hook. f............	v.
Nephelium foveolatum, F.v.M.	ii.
Beckleri, Benth.......................	ii.
Harpullia Wadsworthii, F.v.M.................	ii.†

ROSACEÆ.

Rubus Moorei, F.v.M............................	iv.
Prunus Lusitanica, Linn.	iv.
domestica, Linn.....................	iv.

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* Probably the species *E. foveolatus* was named from the presence of itia. I have not seen it.

† *Cupania foveolata*, F.v.M., is described as having dimples in the axils.

SAXIFRAGEÆ.

Hydrangea hortensis, Sieb. .... iv.

VINIFERÆ.

Vitis Baudiniana, F.v.M. .... ii.

ARALIACEÆ.

Panax elegans, C. Moore et F.v.M. .... ii.

OLACINEÆ.

Pennantia Cunninghamii, Miers .... i.

RUBIACEÆ.

Gardenia sp.hort. .... iii.

Randia chartacea, F.v.M. .... i.

Moorei, F.v.M. .... i.

stipularis, F.v.M. .... i.

densiflora, Benth. .... iv.

Hodgkinsonia ovatiflora, F.v.M. .... iv.

Canthium oleifolium, Hook. .... i.

lucidum, Hook. et Arn. .... i.

CAPRIFOLIACEÆ.

Viburnum chinense, Hook...................... iii.

APOCYNEÆ.

Mandevillea sp.hort............. .... iv.

SOLANACEÆ.

Solanum sp.hort............ .. .. iv.

BIGNONIACEÆ.

Tecoma Capensis, Lindl............ .... iv.*

VERBENACEÆ.

Vitex littoralis, Cunn.............................. i.

I have counted the species of domatia-bearing plants in each order in Lundström's, Lagerheim's, and this paper, and arranged them in descending order.

Rubiaceæ, 107; Tiliaceæ, 40; Bignoniaceæ, Oleaceæ and Lauraceæ 16 each; Cupuliferæ, 15; Solaneæ, 13; Apocyneæ, 12; Rhamnaceæ, Aquifoliaceæ and Juglandiaceæ, 6 each; Loganiaceæ and Anacardiaceæ, 4 each; Caprifoliaceæ, Bixaceæ, Meliaceæ, and Rosaceæ, 3 each; Compositæ, Ribesiaceæ, and Hamamelideæ, 2 each; Asclepidiaceæ, Sapotaceæ, Aceraceæ, Myrtaceæ, Magnoliaceæ, Ulmaceæ, Platanaceæ, Sterculiaceæ, Olacineæ, Araliaceæ, Viniferæ, Saxifrageæ, and Verbenaceæ, 1 each. From the above it will be seen that the orders Rubiaceæ and Tiliaceæ are far before the others in domatia-bearing species.

There are, however, included in Dr. Lundström's list some plants which are only doubtfully possessed of these structures, and one or two which certainly are not. To take the latter first.

TECOMA AUSTRALIS, R.Br.—Dr. Lundström says (1, p. 37)—This plant "has 1-3 dimples which are (always ?) inhabited, but

* Remarkable as having branching hairs in the axils.

closer examination by those biologists wh
of studying them in the open" The stru
in quite a number of plants, *e.g.*, *Cedrel*
laevis, and many indigenous Rutaceæ.
hollows, and when young the edges ove
transverse section the appearance of such
in *Coprosma*. But the whole cavity is fill
or elliptical gland, flat-topped, shining w
coloured. Sometimes in old leaves the g
apparently dried up and fallen out. In
occur on the veins, usually near the top
instance I found one in the hair-tufted
the first stage of a domatium. But ord
from the veins, and I could not find any
their occurrence. Acarids are sometimes

"ACACIA DEALBATA, Link. (1, p. 54)
along the rhachis in a row on the uppe
frequently uninhabited as far as I have b
These peculiar formations may well
examined in a natural state." These
domatia, but true secreting glands with
secretion, which, judging from the fondn
sugary nature.

QUERCUS ROBUR, Linn.—At the base o
backward curves forming shell-shaped c

ILEX spp.—Dr. Lundström describes backward curls of the edge of the leaf near the base, forming a cylindrical room, and found here the cast skins of mites. But so far as dried material could show, there was not the peculiar structure found in domatia. I have found in *Eupomatia laurina* similar structures, but could find no mites or traces of them.

SCHINUS spp.—These have a wing on the rhachis provided with a small tooth on each side at the insertion of the leaf, which folds over and forms a cavity. I am inclined to think that none of these structures are true domatia, and would restrict that term to cavities or depressions in the leaf surface showing the peculiar appearances described under the types I have taken. But under Dr. Lundström's definition of a domatium, viz., all those structures of plants which act as dwellings or shelters for insects and receive in turn some benefit from the latter, all these might be included.

Dr. Lundström classifies domatia into the following five groups —(1) Hair tufts at axils; (2) bending back or folding of leaf or edge of rachis; (3) dimples with or without hairs; (4) small pockets; (5) bags, &c. His group 1 corresponds with my group 4; his 3rd with my 1st, and 4th with my 2nd. His 2nd and 5th groups I have not taken to be domatia, and he does not particularly notice my 3rd or 5th groups.

I have arranged the groups of types as shown because it indicates the order of development—beginningwith the highest. The domatium usually begins either as a small hair-tuft or a depression. Then an outgrowth from the veins begins extending right across the angle. Later a ridge thickens up across the open angle and runs round to the sides, so that when all the parts are grown to full height a circular orifice is formed. This is well seen at times in *Vitis Baudiniana*, which usually has the triangular pouch, but at times forms the circular cavity in this way. As the order of types, beginning with the 5th, represents the development of the domatia in a single plant, so also it probably brings before us the order of evolution.

So far as I have looked into the matter, it appears to me that domatia are most common in plants of a southern origin. At any

mata were contained in crypts in which they were sheltered m excessive transpiration by long hairs, and that under altered nate and other conditions the stomata passed out to the eral surface, leaving the pits as relics of the former state of rs. I made a careful examination of several species of ... and of *Nerium*, but found the crypts of a totally different acter, and in addition, in both genera, the crypts are evenly tered all over the surface, while in the species under con- eration they occur only in the axils of the veins, or rarely (*e.g.*, *nuntia*) on the course of the veins and appear to have a nite relation to those organs.

Again, the solution was offered that they might be extra wths caused by the superabundance of sap at the axils. But fact that they are found mostly in the middle axils on the rib, and not on the lower ones, where the sap would naturally more plentiful, bears against this, and their regular organisa- n and appearance I think sufficiently negatives this theory.

The purpose which seemed to me most feasible, and which I k most pains in working out, was that they might perhaps be ans for absorbing gas, vapour or water, and this seemed all the re likely from the fact that the plants possessing them are all abitants of moist climates, New Zealand, Norfolk and Lord we Islands being their head quarters. Careful experiment wed that they would not fill when the leaf was wetted, the ll opening being stopped by an air bubble, nor could I, even prolonged submersion succeed in filling them. To be sure I s not mistaken, I tried an alcoholic stain (as it flowed freely would leave the epidermis stained as a record) and even pped the cavities out with alcohol to encourage capillary action, still the liquid would not run in. Mr. Betche tells me he ceeded in filling the pouches of *Dysoxylum Fraserianum* by mersion for some hours, and he thinks the fact that dust is often nd inside is an additional proof that rain does run in and ries with it foreign matter. Their position on the under side he leaf, too, is to some extent unfavourable for their filling, so t on the whole I had to abandon the hypothesis. I also tried

-nefit these little animals may be to the plant, he says they eat, -d as a consequence excrete and give off gases, and he thinks probable that the excreta and gases are absorbed by the plants, -hich are thus benefited. He also speculates as to whether -tain crevices observed in some fruits may not be domatia to -elter the mites till the young plant grows and gives them the -f-domatia. Still another service they may do is that they may -t the spores and mycelia of noxious fungi which rest and -minate on the leaf, and in support of this he mentions having -n minute rings which were undoubtedly the chewed mycelia, -d also digested spores in the excreta. Some of the strongest -idence he has to offer in favour of there being a relation of -tual helpfulness between the two is as follows:

Speaking of *Psychotria daphnoides* he says: "I have kept a -ecimen of this species for six years in a dwelling room. When -was brought thither the domatia were for the most part -habited, but afterwards the mites almost entirely disappeared, -rtly because they were swept off with a brush, and partly -nished by smoking. It was curious to observe how the unin- -bited domatia on the new sprouts altered by degrees, the hair -mation almost entirely disappeared, the opening widened, and -e inside of the domatium passed into a shallow cup-shaped -pression . . . . On some leaves the domatia have almost -tirely disappeared, and the epidermis in the vein axils has by -grees assumed the same appearance usual to the under side of -e leaf. At the same time the domatia which remain inhabited -ain their normal form. From these facts, it may, in my opinion, -inferred that when the corresponding organs on a sprout find -opportunity for action, *i.e.*, do not become inhabited, the -matia on the following lateral sprouts become more and more -dimentary till they disappear. Whence it follows that the -portance of the domatia depends on the little creatures inhabit- -g them" (1, p. 15).

Speaking of the protoplasm in the cuticle of the domatia walls: "It remains to examine more closely how this protoplasm behaves -cells which lie under the excrement of mites; in some sections

it seemed considerably browner and thick
was not distinguishable from the plasma of
covered with masses of excrement. . . .
of consecutive sections of an inhabited dom
that the inner wall is quite unhurt, not inj
bites" (1, p. 20).

Again, under *Laurus nobilis*: -"On a sp
high which I have kept six years in a room,
mites have been removed partly by smoke
of a brush, the domatia have become by d
indeed have quite disappeared from certain
distinctly proved by this, that where mites
domatia have not attained their normal deve
that the full development of the domatia is in
with the presence of mites" (1, p. 49).

By means of carefully planned cultu
attempted to prove that the domatia only ca
of the mites, but partially failed, as the resu
duce domatia, although fewer in number, s
hairs than normally. On p. 61, he says it ha
that the domatia in *Psychotria*, *Tilia*, *Lauru*
reach their full development in the presenc
these being absent, the domatia do not devel

After prolonged consideration of the subje
Dr. Lundström's theory as perfectly expla

he domatia. I have often seen them in cracks and crevices of the lant, as between bud-scales, or in the chink between a petiole nd a stem, as has Dr. Lundström himself. But I do not think hat it is necessary to consider any of these places as dwellings pecially prepared for the mites. Indeed Dr. Lundström uses an ot illustration of this very point when he says it would be as asonable to consider a wood where a hare was started as a elling specially formed for the hare. The fact that the two nts in which I found great numbers of mites had in the one e diseased and in the other damaged domatia is very important, ecially as they were not the hurtful mites, but of the same d as those figured as domatia-dwellers. Again Dr. Lundström es the fact of the leaves containing most domatia being very ıriant in growth and very healthy as proving the benefit ved from the mites. But is it not possible that the Acarids ht be attracted by those very states?

n the whole, therefore, while not denying the possibility of Lundström's view being the right one, I am of opinion (and I forth my opinion in opposition to that of so good an observer ı considerable hesitation) that the whole question needs much her observation and research. The following points need ial attention :—

). The development of the tissues in all stages of the formion of the organs.

). The careful determination of the species of mites found in ı species of domatia-bearing plants (*a*) in a state of nature; in plants cultivated in different countries.

here also remains much to be done in the discovery of other ıatia-bearing plants, and in the habitat in which each is found.

should have mentioned that I have never been able to find er in specimens or in figures of fossil leaves any appearance hese structures.

But Mr. Henry Deane informs me that from Gippsland he has ie fossil leaves of a Coprosma-like plant which apparently show ided prominences in the principal vein-axils. As this is the ariable situation of domatia in that genus it is not improbable

that they may be these organs. That they are of great antiquity I have no doubt.

I have to thank three lady friends for translating Dr. Lundström's valuable memoir, and also Messrs. E. Betche, J. J. Fletcher, and J. P. Hill for very material assistance.

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EXPLANATION OF PLATE.

Pennantia Cunninghami (Figs. 1-5).

Fig. 1.—Part of leaf showing arrangement of domatia on veins

NOTES ON TWO PAPUAN THROWING STICKS.

By J. Jennings.

(*Communicated by C. Hedley, F.L.S.*)

(Plate lviii.)

Preceding volumes of these Proceedings contain a series of articles by Mr. R. Etheridge, junr., describing and figuring in detail numerous varieties of the womerah or Australian throwing stick.*

Only in recent years has it been announced that a like implement is also employed by the Papuans of Northern New Guinea. Finsch figured and described† a specimen which he collected at Venushuk, New Guinea, and Edge Partington illustrates, apparently by a copy of Finsch's figure, this throwing stick.‡ Ratzel in the Natural History of Man also gives figures.§

By far the fullest account of the Papuan form of the throwing stick, however, we owe to Dr. F. v. Luschan, who in "Das Wurfholz in New Holland und in Oceanien," Bastian Festchrift, Berlin, 1896, pp. 131-155, Pl. ix., x., xi., has dealt exhaustively with the subject. Specimens of the Papuan type which have lately been acquired by my friend Mr. Norman Hardy do not exactly coincide with any portrayed by Dr. v. Luschan. I have therefore obtained permission to lay before the Society the following account and accompanying drawings of two specimens, the

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* Series ii. Vol. vi. p. 699, fig.; Vol. vii. pp. 170, 399, Pls. iii. and xi.; Vol. viii. p. 300, Pl. xiv.; Macleay Memorial Vol. p. 236.

† Ann. K.K. Hofmus. Vol. iii. 1888, Pl. xv. f. 5.

‡ Ethnographical Album, 189, Ser. 1, Vol. ii. Pl. 37, f. 1.

§ Ratzel, "The History of Mankind," English Ed. I. 1896, p. 181.

former of which is said to have come from Berl
German New Guinea; the second is without a histor

The first weapon (fig. 1) is made from a piece of ne
bamboo, weight 6¼oz., 2ft. 2in in length and barely
diameter, embracing three nodes. At a distance of 2¾
the distal end and half an inch from a joint, a transv
has been made through two-thirds of the diameter, th
gradually and obliquely ascends to the upper surface,
at a point 11½ inches distant, the whole incisio
resembling what is technically known to carpenter
Two inches in front of the above described incision
by ½in. wide has been excavated for the reception
hard wood richly carved in high relief and inclined
angle towards the distal end, which evidently was
rest for the spear when being aimed and thrown. T
in its place are two rings of split and interwoven
inches apart, these being in their turn held together
strands of fibre The entire carving is eight inch
broad, and half an inch thick, and the design that
tionalised crocodile, the head, body and tail being
appropriate segments.

The head is portrayed with a considerable degree
the nasal prominences and eyes being carefully lo
body seven imbricating scales indicate the dorsal
concentric grooves divide the sides into oval ridges;
surface of the tail scutes are again suggested b
method of treatment, while the sides harmonise wi

The second weapon (fig. 2) is similar in construction to that above described, but is somewhat longer, being 32 inches from end to end and weighing $4\frac{1}{2}$ oz. Rather more than 2 inches from the distal end a sloping groove, as in the previously described implement, has been cut for a distance of $15\frac{3}{4}$ inches, not as in the first instance in a plane with a carved rest, but inclining to a considerable degree towards the right, thus indicating the side on which the spear was held. The carved wooden projection against which the spear was rested is 7 inches long, inclines at the same angle and in the same direction as the former, and is attached to the bamboo shaft at both ends by means of woven bands of split bamboo, midway between which is a third and lighter band. This highly interesting feature differs very much in character from fig. 1, being much lighter, carved in lower relief, and is more conventional in design.

An elongated human (?) head on the upper end is directed from proximal in a distal direction by a curved and pierced band connected with the body of the implement; this surrounds two intersecting pierced ovals which are proximally attached to an irregular elongated triangular body of which the upper or dorsal edge is unevenly serrated and pierced, the whole forming an acute angle with the main body of the instrument; the flattened sides are decorated in a design formed by successive curved bands, chevrons and dots carved in low relief. A handle convenient for grasping is afforded by a finely plaited bamboo knob or bulb which is fastened in its place by a strong wooden peg. The distal termination is in its main character like that of fig. 1, but for a distance of 2 inches is carved in a series of bands, chevrons and dots harmonising in design with the flattened sides of the spear rest.

Some ethnologists have traced a connection between the Australian Aborigines and the Dravidians of India. It has been suggested to me by my friend Mr. C. Hedley, F.L.S., that the isolated occurrence of a womerah on the north coast of New Guinea may indicate a vestige of the emigrants on the line of march, for it is even possible that while the identity of a race

Australians or their kin; indeed, it may ha
arrived at by various peoples.

The Papuan implement is broadly disti
the numerous aspects assumed by the wom
the former case, the spear end is received
latter the spear is cupped to receive the
Again, the former is remarkable for the
crest against which Dr. Luschan states the
no homologue occurs in the Australian typ

The Micronesian form may be describe
but without the raised spear rest; in Micro
described it from the Pelews, and Luscha
that Archipelago and from the Caroli
device for propelling spears from a loop of
from New Caledonia.§ The Esquimaux
throwing stick which has been described
Mason;|| mention of the use of this inst
the Polar regions has also been made b
Nansen.** Lieutenant W. H. Hooper m
used by the Esquimaux of Icy Reef, Hum

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* Nevertheless, Mr. Harry Stockdale has in
observed an exception to this rule in the case
(Australia) tribe who used a socketed womerah.

† Keate, "An Account of the Pelew Islan

The Central and South American throwing sticks have been
ılt with in a most thorough manner by Dr. Ed. Seler* in a
er entitled "Altmexicanische Wurfbretter," which is finely
ıtrated both by woodcuts and coloured plates. Dr. Hjalmar
ɔe in the same publication† communicates a valuable article
ıe subject, and furthermore gives illustrations of the weapons
by the Tecunas, Canibos, Quito, Campevas and Chambiriguas
ı of South America, in all ofwhich the spear is kept in place
peg.

EXPLANATION OF FIGURES.

right hand division of the plate constitutes fig. 1; the left, fig. 2.

ıternationales Archiv für Ethnographie, 1890, Band iii. pp. 137-148,

† *Loc. cit.* pp. 234-238.

'Lid conical, and, as well as the calyx, angular, and somewhat -edged. Heads of flowers lateral, solitary, on flower-stalks.

The *leaves* are ovate-lanceolate, firm, astringent, but not very ıatic. We have seen no other species in which the *flowers* l in little dense heads, each flower not being pedicellated so form an umbel. The *lid* is about as long as the *calyx*. *r-stalk* compressed, always solitary and simple.

he fruit of this species, standing on part of a branch whose are fallen off, is figured in Mr. White's 'Voyage,' p. 226, with the leaves of the next species." ('Botany of New nd,' p. 42).

description was made from plants procured in the neigh- ood of Sydney.

nacular names.—"Red Stringybark" is a name generally d to this species in this colony in allusion to the darker of the wood as compared with that of *E. eugenioides*, White ;ybark. It also goes under the name of "Broad-leaved ;ybark." In the Walcha district it appears to be confused Red Mahogany.

lling or sucker leaves.—These are well represented in :t's 'Eucalypts of Gippsland,' Pl. 14 (Trans. Roy. Soc. Vict. Like those of *E. macrorrhyncha* and *E. eugenioides*, they aced opposite one another at an early stage, but very soon ıe alternate. The young shoots are warty.

ture leaves.—They are very coriaceous, even when grown at ıiderable distance from the sea. The leaves are larger and r than those of two other Stringybarks (*E. macrorrhyncha* *'. eugenioides*), and very oblique.

ds.—The buds and peduncles are generally somewhat thick ngular or flattened, and contrast with the neatness of shape se of *E. eugenioides* and *E. macrorrhyncha*. In some cases, er, the buds are round, symmetrical and plump, and resemble nearly those of *E. eugenioides*.

wers.—The filaments of the anthers sometimes dry dark.

uits.—In consequence of the fruits being sessile or nearly so rowded into heads, they assume a polygonal shape at the

the rim, which is sometimes very well de brown colour. The fruit is sometimes frequently the rim is dome-shaped.

There is great variability in the amount valves. In an example from Wallsend in has the same character as the Sydney form. less compressed, and the valves more exser

Timber.—The wood, as already state reddish, and darker than that of *E. eugen* in the ground and is otherwise durable. building purposes, but is very free.

Range.—Howitt states in his 'Eucalyp he has not seen it growing at a less elevat that it cannot therefore strictly speaking littoral species. In this colony, however quite close to the sea; for instance, on harbour, and from the coast inland to Dividing Range. The most northerly lo have it is the Round Mountain, Guy Fa above the sea, and about 50 miles east Grafton Road.

The most westerly locality from which i Mudgee, where it is called "Silvertop" a Baker, who collected it.

Variations from type.—The most remar

ion, with pointed operculum, and the pedicels are long, so that flowers and fruits form loose heads.

ernacular names.—It is usually known as "Stringybark" ly, but by comparison with *E. eugenioides* as "Red Stringy-" According to Howitt, it is known as "Mountain Stringy-" in Gippsland, a name to which in this colony the other gybarks have also some claim. *E. macrorrhyncha*, however, rs to be quite absent from the coast districts.

dling or sucker leaves.—The remarks made under *E. capitellata* equally to this species.

ture leaves.—These are coriaceous and much resemble those *capitellata.*

ds.—These are strongly pedicellate, and the edge of the tube forms a prominent ring, while the operculum is inate and often lengthened out into a point. In the matter ape one cannot help likening them to those of *E. rostrata*, 1, however, are very small in comparison.

uits.—These vary somewhat in shape and size, but owing to ong pedicels, the prominent edge to the rim, and the domed they can always be recognised. A particularly large-fruited has been collected by Mr R. T. Baker in the Rylstone ict, where trees with fruits of ordinary size are also found. remark about the buds as to their resemblance in shape to of *E. rostrata* applies here also.

mber.—This seems in every respect to resemble that of *E. ellata.*

nge.—In Gippsland this is essentially a mountain species, Mr. Howitt has not seen it growing at a lower elevation than feet. In this colony it is found along the Dividing Range Table Land from New England in the north. We have it Mt. Wilson, from Yass, and from near Delegate. It grows n the western slopes and on the spurs of the main range and he isolated ranges some distance into the interior. The most erly localities actually recorded are Mudgee and Grenfell.

or nearly so. Fruit expanded below the ri

E. macrorrhyncha.—Operculum acuminat and fruits strongly pedicellate; calyx borde

But these characters are not absolute, a types, considerable variation occurring in s

Baron von Mueller in the 'Eucalypt *macrorrhyncha*, says:—

"*E. macrorrhyncha* stands nearest to *E.* fruits of both are the same; but the flow always sessile or nearly so and thus crow species name signifies, besides being usuall *E. capitellata* is hemispheric, without any shorter in proportion to the tube, the la angular and downward less attenuated."

With all respect to the very high aut Mueller, we cannot agree that the fruits of *macrorrhyncha* are the same; and a study two species in the 'Eucalyptographia' will p the statement; we, however, show that th forms.

Under *E. macrorrhyncha* in the 'Flora Au

"Var. (?) *brachycorys.* Operculum short *E. macrorrhyncha.* Expanded flowers not affinities uncertain. New England. "Stri 207).

...s be examined in fruit only (without reference to the buds), ...y may be readily mistaken for *E. macrorrhyncha.*

Usually, however, these connecting links between *capitellata* ...d *macrorrhyncha* show a leaning towards the type of either one ...ecies or the other, so that we may conveniently classify them, but ... regard to the following tree we are unable to place it with ...her one species or the other. It is the tree found on the Gulf ...d, Rylstone district, and attributed to *E. obliqua* by R. T. ...er, Proc. Linn. Soc. N.S.W. 1896, p. 446.

...he buds resemble those of *E. eugenioides.* The fruits are shortly ...icellate, and in that respect approach *E. macrorrhyncha*, but ...erwise they are hemispherical and flat-topped like many speci...s of *E. eugenioides*, but there is a distinct and sharp edge or rim, ...h a tendency to doming, like *E. macrorrhyncha.* The valves ... only slightly exserted. The buds appear to us dissimilar to ...se of *E. obliqua*, and the fruits are too broad and hemispherical ... that species, the only real resemblance to *E. obliqua* existing ...the leaves, which, however, equally resemble *E. capitellata.*

We have specimens collected by Mr. Augustus Rudder in the ...ne district and named by him "Mountain Stringybark." They ...ve fruits with slightly longer pedicels and many of them are ...re of a domed character, but on the same twig with these ...newhat dome-shaped fruits are other fruits precisely similar to ...se from the Gulf Road. We are quite of opinion that they ... from identical trees, and would on no account place them ...der *E. obliqua.*

Should it be found necessary, on account of persistence of ...aracters over a large area, to separate this tree from *capitellata-...acrorrhyncha* (it being desirable, in our opinion, to look upon it ... a connecting link between these species, for the present), it ...ould perhaps be advisable to give it specific rank.

EUCALYPTUS EUGENIOIDES, Sieb.

Sieber's definition of *E. eugenioides* (Sprengel's Curæ Posteriores .... 195), is as follows :—

Vernacular names.—It is usually known as
bark" in this colony, the colour of its timbe
that of either *E. capitellata* or *E. macrorrhync*

Seedling or sucker leaves.—These are well
'Eucalyptographia' and in Howitt's 'Eucaly
The young shoots are warty and the leaves,
placed opposite to one another, soon become al

Mature leaves.—These are generally much
delicate in texture than those of *E. capitellat*
rhyncha. They are also of a richer green, mor
and Eugenia-like, a circumstance which led to
bably of the specific name. Exceptions, h
specimens in our possession from Wallsend
coriaceous and shiny.

Buds.—The buds are clustered and often v
into heads, by which the inflorescence assume
character. They always have pointed opercul
sometimes so marked as to approach those of
but they are then fuller on the top and do not
nent edge at the base of the operculum.

Fruits.—The fruits are slightly pedicellate,
more or less globular heads, but not compre
E. capitellata. They are much smaller than t
species, somewhat hemispherical in form, with
Occasionally the fruit is quite flat-topped. Th

ırp. It is often considered, as at Mudgee, superior to "Red ringybark" (*E. macrorrhyncha*).

Range.—Coast district and tableland throughout, and extending sterly as far as Mudgee, though apparently not so abundant as *macrorrhyncha.*

n the 'Flora Australiensis' *E. eugenioides* is reduced to a variety *E. piperita*, but it has since been shown to be an undoubtedly l species, its affinities being more with *E. capitellata* than with *piperita.* From the latter it is easily distinguished in the ıg state by the strong fibrous character of the bark which nds to the small branches, the other species having a bark of texture of *E. amygdalina*, and being only half-barked in ral like *E. pilularis.* The fruits of *E. piperita* are more con-ted at the top with a thin rim, whereas those of *E. eugenioides* a well-marked rim, sometimes flat but generally raised.

'e have leaves and fruits of a very interesting Stringybark ı the Glen Innes district (Hartley's Mill). We refer the t to *E. eugenioides* in the absence of complete material. The ;s are larger than those of *E. eugenioides* usually are, and a well-defined prominent rim, grooved on the outer edge, and v a tendency to exsertion of the valves.

. *capitellata* and *E. eugenioides* are very intimately related. des their relation as Stringybarks, we have trees with fruits haped that it is not entirely satisfactory to refer them to er species.

ome fruits show a tendency to *E. capitellata* in having fruits er and more "squatty" or compressed than those of *E. enioides.* But the valves of the fruits are not exserted, nor the buds so flat and angular as those of *E. capitellata* usually The buds are, in fact, those of *E. eugenioides.* The precise pe of the fruits will be seen on reference to the figure LX. fig. 1). These intermediate forms are common on Southern Dividing Range and the Blue Mountains. On both ges we have typical *eugenioides* and *capitellata*, together with intermediate forms alluded to.

appearance to the ordinary form of E. eug

at first sight, be reasonably supposed to

have many gradations between them and

This head-flowered form may, perhap

exuberance of growth arising from unusu

At Hilltop, near Mittagong, there is a

"Blueleaf Stringybark." It appears to

the gullies about there. It is so call

especially in the sunlight, are observed to

this bluish appearance (especially noticeab

is largely retained on drying for the herba

trees can be readily noticed, amongst th

neighbouring eminence. The fruits are in

if it were desirable to distinguish this

eugenioides, the name *agglomerata* wo

(See Agric. Gazette N.S.W. vii. 268, May

E. OBLIQUA, L'Her

Although this species is so well-known

mania, its occurrence in New South W

observed by botanists. Yet it is a fine w

in the south-eastern district, and the timb

a ready market.

Vernacular names.—It is usually kno

in Tasmania and South Australia, and to

in the last colony, however, it is usually

se it is usually rough-barked to the ends of the branches, imes goes by the name of "Woolly-topped Messmate" in dwood district (Monga, &c.).

ng or sucker leaves.—Broadly ovate, somewhat cordate, to become unequal, but not always so, and apparently attenuate, as pointed out by Howitt. Venation well and more transverse than in the foliage of the mature

of mature trees.—It is a coarse-foliaged tree, by which ristic alone it can usually be distinguished from those vith which it is usually associated, or with which it is be confused. Its strikingly oblique, unsymmetrical ave no doubt given origin to its name. Obliquity is a r of nearly all Eucalypt leaves, but in the species under ation and in *E. capitellata* it is particularly observable. es are sometimes dotted and channelled like *E. stellulata* i. p. 598).

—A figure of the usual Victorian form will be found in alyptographia;' we give a representation of the fruit as the southern mountain ranges in this colony.

ifice is sometimes a little contracted, reminding one, in ect, and in its general shape of the capsule, of some forms *perita*, but it is larger than the fruit of that species. accentuates the contraction of the orifice in both. The be at once separated by the venation and shape of the hape of the buds, &c., but the two species approach one sometimes very closely in the shape of the fruits.

ruits in the southern parts of this colony are sub-al in shape, while those of the Victorian specimens, n the 'Eucalyptographia,' are more hemispherical.

ruits of *E. gigantea*, Hook. f. ('The Botany of the c Voyage;' Hooker, 'Flora Tasmaniæ,' t. 28) usually to *E. obliqua*, and doubtless correctly, are more pear-and with valves more sunk, than we have observed in the th Wales specimens.

Timber.—Timber from New South Wales inferior, coarse, open-grained porous wood, warp. It is not esteemed for public works. be, at least in part, a consequence of rapi according to several authorities, *E. obliqua* l

It has been used in the Braidwood and many years for building purposes. In Vict is largely used, and a recent official publ colony states "It is our most valuable wo the value of this statement it should, of cou that neither of these colonies possesses a serie such as New South Wales can boast of.

Range.—Chiefly a Tasmanian and Victoria in many places along the top of the easter range from Braidwood south. Its northernr for further investigation, but it extends River. It is found growing in company wit other species on the Irish Corner Mounta Loaf Mountain, and around Monga, both western fall of those mountains. The trees and are to be found growing to a height of f with a girth of from 6 to 10 feet.

Howitt (Trans. Roy. Soc. Vict. ii. Pt. i, the statement, as regards Gippsland, that essentially a littoral form, but ascends the m

above the sea. At Reidsdale it occurs at an elevation of n 2000 to 2500 feet.

'. *obliqua* has never been positively recorded from north of ney; in fact, its recognised localities are many miles to the h. Nevertheless, we have a specimen undoubtedly, in our ion, belonging to this species, obtained by an experienced ctor in the ranges in the Upper Williams River district. precise locality is unfortunately lost, and therefore we do not to do more than invite the attention of botanists to the ability of searching for *E. obliqua* in the district named. collector is Mr. Augustus Rudder, formerly forester of the ct, whose recollection is perfectly clear in regard to the nen referred to.

e Eucalypt from Gulf Road, Rylstone district (R. T. Baker, :. Linn. Soc. N.S.W.' 1896, p. 446) we have discussed under *icrorrhyncha (ante*, p. 803).

e following description of *E. obliqua* from Sir J. E. Smith's imen of the Botany of New Holland,' p. 43 (London, 1793), eresting, and may be convenient for reference: —

'*ucalyptus obliqua*, operculo hemisphærico mucronulato, llis lateralibus solitariis; pedunculis ramulisque teretibus. id hemispherical, with a little point. Umbels lateral, ry; flower-stalks and young branches round.

yn. *E obliqua*, Ait. Hort. Kew. v. 2, 157; L' Herit. Sert. t. 20."

'rom the only specimen we have seen of this, which is in Sir h Banks' herbarium, it appears the *branches* are all round to ery top. *General flowering-stalks* round, the *partial ones* slightly angular, not compressed. *Bark* rough from the g off of the cuticle, but this may be an unnatural appear- *Leaves* ovate-lanceolate, aromatic, but without the flavour permint."

E. FASTIGATA, n.sp.

roductory.—While dealing with the Stringybark group we attention to a tree which is very closely related to one of , and is, to all intents and purposes, a Stringybark. We

resembles *E. obliqua* in bark and wood, whil have very dissimilar buds and fruits. The on blance to *E. amygdalina* lies in the fruits, whic those of our variety *latifolia* figured in our for series.

We do not hesitate to say that "Cut-tail" ca under any existing species, and therefore p *fastigata* for it, in allusion to the shape of th leaves.

Vernacular names.—Several names are more different places. The one most in use, wher best developed, is "Cut-tail," and inasmuch a applied to any other tree, so far as we are aware, that all other English names be dropped as favour of this. We have made many enquiries of the term "Cut-tail," but without success, an that it has reference to the rough bark on the comparison with *E. obliqua*, which it so much re appearance, it is cut-tailed or curtailed.

Other names that have been mentioned to u "Blackbutt," on the Nimbo Station, Braidwood on the Tantawanglo Mountain, "Messmate. Messmate" and "Silvertop" at various pla barrel" at Queanbeyan."

Seedling or sucker leaves.—Ovate-lanceolat oblique; scattered, in this respect very dissim

always more or less attenuate. They are rather coriaceous, smooth and rather shining. They possess no odour of peppermint.

Buds.—The chief characteristic is the shortly acuminate operculum, which is much accentuated in dried specimens. In *E. obliqua* the operculum is blunt, and the whole bud club-shaped, very different to those of the species now under review.

The anthers are partly folded in the bud.

Fruits.—The figure (Pl. LXI.) will make the shape clear. They are pear-shaped, have a conical or domed rim, with the valves somewhat exserted. They are always 3-celled as far as seen. Diameter of rim $2\frac{1}{2}$ to nearly 3 lines. Length from end of pedicel to rim $2\frac{1}{2}$ lines.

The fruit differs from that of *E. obliqua* in being more or less conical, while that of *E. obliqua* is subcylindrical. The latter species has no well defined rim and the valves are sunk, whereas in the tree now under consideration there is a prominent rim, while the valves are somewhat exserted. The fruits of *E. obliqua* are also larger than those of our species and have shorter stalks. In the latter species the peduncles are elongated over half an inch in fruit, and are distinctly pedicellate, about $1\frac{1}{2}$ lines.

Bark.—It resembles closely that of *E. obliqua*, the principal difference between the two trees, in this respect, consisting in the fact that the tops and the branches of "Cut-tail" are smooth, while those of *E. obliqua* are the reverse.

Timber.—It has all the characteristics of the timber of *E. obliqua*, from which it is scarcely, or not at all, to be distinguished. At Montgomery's mill on the Tantawanglo Mountain, near Cathcart, the two trees are considered of equal value, and the timbers of the two cut up and sold as one and the same.

Range.—The coast range from Tantawanglo Mountain to near Braidwood, so far as observed at present. Specific localities are:—Tantawanglo Mountain, growing with *E. obliqua* and *E. goniocalyx*; Nimbo (head of Queanbeyan River), mixed with stellate variety of *E. goniocalyx*; Braidwood district (Reidsdale, Irish Corner Mountain), with *E. obliqua* and *E. goniocalyx*.

We have not yet determined whether it occurs to the west of the Dividing Range.

Fig. 2.—Fruit from Bendigo, Victoria.

Fig. 3.—Fruit from Albury.

Fig. 4. }
Fig. 5. } Fruits from Rylstone ; No. 5 is especially lar

Fig. 6.—Umbel and young buds.

Fig. 7. } Types of the angular buds, with beake
Fig. 7A. } Rylstone.

E. capitellata.

Figs. 8 and 8A.—Fruits and buds of common Sydney f

Fig. 9.—Fruits from Kalgoola, Mudgee district.

Fig. 10.—Fruits from Mt. Victoria, showing flattened and lateral compression.

Fig. 11.—Fruits from Round Mountain, New England

Fig. 12. } Fruits intermediate in character between
Fig. 13. } *eugenioides*, from Stroud and Hill Top (Mit

Fig. 14. Buds of *E. capitellata*, showing a less flatte

Fig. 15.—Fruits depicted in White's 'Voyage,' p. 22 described by Smith, *Trans. Linn. Soc* *capitellata.*

PLATE LX.

E. eugenioides.

Fig. 1.—Fruits from Mt. Victoria.

Fig. 2.—Fruits from Tweed River, showing slightly e

Fig. 3.—Fruits from Ulladulla, showing hemispherica

Fig. 4.—Fruits from Bega, showing sessile character.

Fig. 5.—Fruits from Cabramatta, near Sydney, showi dense globular head.

Fig. 6.—Fruits from Homebush, near Sydney, showi sunk rim

Fig. 11. } Fruits and buds of the Eucalypt provisionally placed between *E.*
Fig. 12. } *capitellata* and *E. macrorrhyncha* (Gulf Road, R. T. Baker; also Mr. Rudder's specimen).

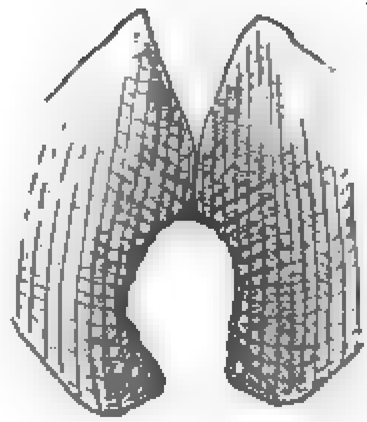
PLATE LXI.

E. fastigata, sp.nov.

Fig. 1.—Seedling foliage.
Fig. 2.—Twig in bud.
Fig. 3.—Mature leaf, showing venation.
Fig. 4.—Fruit, showing exserted valves.
Fig. 5.—Transverse section of fruit.

PUPINA BIDENTATA, sp.n.

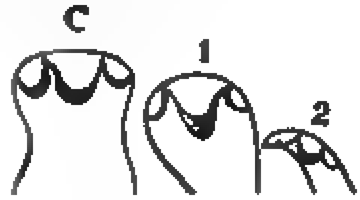
Jaw consisting of a chitinous, transparent m the greater part of the lips, minutely reticul magnifying power the me be composed of very nur plaits.



1
Fig. 1.

Radula strap-shaped, wi rows of teeth; formulæ : dian tooth with its base middle, posterior and conc rather small cusps, the larger than the laterals, rounded cutting points. gated, with three cusps, a large blunt cutting point. First marginal with two cutting points.

The dentition is that characteristic of the the peculiarity of the jaw, if that term may b by the arboreal Achatinellas.



Shell pupiniform, sl pale horn colour. convex. Aperture c part of which is encir

enclosing a narrow triangular area which is crossed near the thread-like slit of rounded aperture by a tooth-like process. There is a finer tooth on lower extremity of outer lip which further constricts the fine slit at aperture.

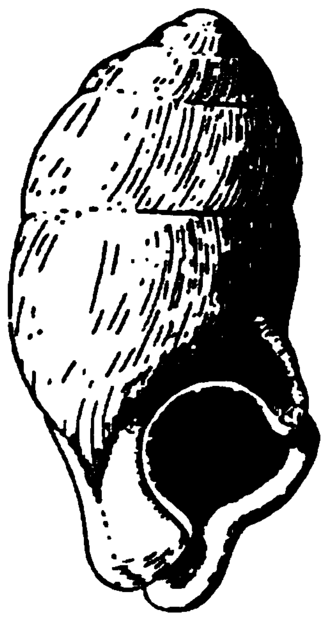


Fig. 3.

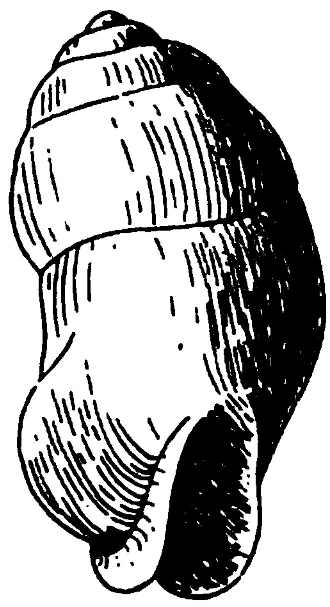


Fig. 4.

Operculum concentric, concave, shining, straw colour.

Length 10 mil., diam. 4 mil., breadth of aperture $1\frac{1}{2}$ mil.

Hab.—Near Cairns, Queensland. The type specimens are in C. E. Beddome's Collection.

EXPLANATION OF FIGURES.

Pupina bidentata.

Fig. 1.—Jaw (× 50).
Fig. 2.—Part of radula (× 240).
Figs. 3-4.—Front and back views of shell.

(Figs. 1-2 drawn from nature by Mr. H. Suter; Nos. 3-4 by Mr. C. Hedley.)

Mr. Fred. Turner sent for exhibition a s
cylindricus, Trin., one of several plants re
near Hay. This very rare grass in New S
hitherto been found growing away from t
before had he seen it, growing in company w
the shores of Port Jackson. Also specimen
tralian leguminous plants (*Brachysema u*
Isotropis juncea, Turcz.), forwarded from th
ture of West Australia, as being plants supp
to stock.

Mr. Edgar R. Waite exhibited a lizard,
Vis, received by the Australian Museum
Suspecting that its characters were common
N. platyurus, Blgr., Mr. Waite examined th
species, kindly lent by Mr. De Vis, when it l
the two descriptions applied to the same spe
accordance with the views of Messrs. Lucas
examination of a series of specimens from
("Report of the Horn Expedition" ii. p.
specimen was shown to record a locality inte
known habitats, Queensland and South A
having been obtained at Bathurst, New Sou

Some varieties of Australian Mollusca

oposes for it the subgeneric name *Euselenops*, in lieu of *Neda* reoccupied in the Coleoptera.

By the courtesy of the Curator of the Australian Museum [r. Hedley further exhibited examples of *Monodonta Zeus*, ischer, a series described without locality in the Journ. de Conch. 374, p. 372. Dr. Fischer's shrewd guess that it was of Australian igin is for the first time confirmed by the receipt of instances llected by Mr. Moore at Dongara, near the mouth of the Irwin iver, West Australia. In the same parcel were also *Monodonta rbonaria*, Philippi, and *Haliotis elegans*, Koch, both noteworthy d of interest as extending the geographical range of these shells.

Mr. Ogilby exhibited for Dr. Cox a small Sole received from . J. K. Larner, Public School, Codrington, caught in fresh ter about 58 miles above the mouth of the Richmond River; identified it with *Aserragodes macleayanus*, Ramsay, which had viously been recorded from fresh water in the Hunter River, *Solea fluviatilis*, Ramsay.

Mr. Brazier read the following

Note on the Shells found in Kitchen Middens at Bondi Bay.

The following is a list of the species of Mollusca found in tchen Middens accumulated by the Aborigines under rock elters at Bondi Bay (Boondi of the Aborigines). *Triton engleri*, Chem., (some specimens broken off at the apex, others th the back of the shell broken, to allow of the extraction of e animal); *Purpura succincta*, Martyn; *P. striata*, Martyn; *inella straminea*, Martyn (the opercula of the same very entiful); *Lunella undulata*, Martyn; *Monodonta zebra*, Menke; *. multicarinata*, Chenu; *Scutus anatinus*, Donov.; *Nerita nigra*, ray (= *N. atrata*, Reeve, *non* Chem.); *Natica plumbea*, Lam.; *atella tramoserica*, Martyn, and *P. aculeata*, Reeve (both species ry plentiful); *P. costata*, Sowb., (= *alticostata*, Angas,—very few ecimens); *Haliotis nævosa*, Martyn; *Plaxiphora petholata*, Sowb., he foot of this Chiton must have been much in request as an ticle of food, the shell-plates occurring in countless numbers in

Mr. Brazier also exhibited (1) a
cuellus, Lam., of unusual coloration (
thickened with enamel of a dark fawn
showing bluish white lines in splashes
place of the ordinary large white spots
Coogee and (2) a perfect adult specim
at the July Meeting as *Clathurella We*
be referred to the genus *Cantharus*, the
having been broken; it is larger th
diameter 5½, length of aperture 6 mm.);
Port Jackson, in possession of a herm
C. australis, Pease, and *C. waterl r*, Ang

Mrs. Kenyon sent for exhibition a se
Rutilus, Menke, and five varieties, *C.*
C. Smithi, Angas, *C. Grayi*, Reeve, *C.*
Anemone, Lam., with young and distor
and communicated a Note thereon.

Mr. Darley exhibited an apparently
in a deposit of hardened mud, 10 feet
the River Darling, 2½ miles below Bour
coffer-dam.

Mr. Darley also communicated some
to the reported occurrence of Teredo
first time at the mouth of the Gippslan
ago, whereas previously both were

Dr. Norton communicated a Note recording an instance in which an ant-resembling spider was observed to attack fatally one of the community in a nest of the so-called bull-dog ants.

The Rev. J. Milne Curran exhibited a fine series of enlarged photographs and numerous rock-specimens illustrative of the physiography and geology of the Mt. Kosciusko Plateau, especially in relation to the so-called evidences of glaciation. Having been ver the same ground as Dr. Lendenfeld and Mr. Helms, Mr. urran could not but agree with Mr. Helms as to the absence of ny evidence of glaciation in the Wilkinson Valley such as Dr. endenfeld had reported. But he also felt compelled to differ om Mr. Helms in respect of the other localities in which this server thought he had detected evidence of glacial action, indicated on the map accompanying his paper; and he was rced to the conclusion that the evidence adduced is wholly sufficient, and that no striæ, groovings, or polished faces due to e action, or roches moutonnées, perched blocks, moraine-stuff erratics are to be met with. Only one example of anything ke a polished block was noted, and in this case the polishing and riæ-like markings were clearly due to a "slicken-side." Most f the granite is of a gneissic character, but normal granites are lso present, the latter weathering into spheroidal masses, the ontours of which in a few cases are suggestive of ice action. It ad been stated that the rocks on the plateau are not such as would preserve glacial striæ. With this Mr. Curran did not agree, as he found porphyries, diorites and basalts, the latter belonging to the non-felspathic section of these rocks, specimens of which were exhibited. Apart from local evidence the general contour of the valleys is not in the least suggestive of glaciers. He therefore concluded that (1) there is no satisfactory evidence of glaciers n the present valleys. (2) There is absolutely no evidence of xtensive glaciation on the Kosciusko Plateau. (3) The "glacial poch of Australia" in Post-Tertiary times as described by Dr. endenfeld, has no foundation in fact.

Mr. Hardy exhibited two examples of the Ner
Knarrarm (Loddon River Tribe), or strangulation cord
were originally obtained by Mr. John R. Peebles fro
the Watty-Watty or the Litchoo-Litchoo tribe at Tyntyn
the River Murray in the year 1857.

WEDNESDAY, MARCH 31st, 1897.

The Twenty-Third Annual General Meeting of the Society was held in the Linnean Hall, Ithaca Road, Elizabeth Bay, on Wednesday evening, March 31st, 1897.

The President, Mr. Henry Deane, M.A., M. Inst. C.E., F.L.S., in the Chair.

The Minutes of the previous Annual General Meeting were read and confirmed.

The President then delivered the Annual Address.

PRESIDENT'S ADDRESS.

I have the honour once more to address you from this Chair.

The year just concluded has been one of fair activity, and the papers read before the Society have been of an important character. There have been nine ordinary meetings, and at these forty-four papers have been read.

Some of the papers have had to me a particular interest as bearing on one of the subjects which I took up for special treatment in my Address last year. These are as follows:—Captain Hutton communicated a paper on the probability of a former land connection between Australia and South America. Mr. Ogilby presented some observations on groups of fishes the distribution of which can scarcely be understood except on the supposition of a former Antarctic continent. Professor David has contributed valuable information on the occurrence of diatomaceous earth and Radiolaria, and the Rev. J. M. Curran read some notes, which are, as I understand and hope, preliminary to a paper, on the supposed glaciation of Mt. Kosciusko.

Mr. Maiden and I have been working at Eucalypts and have presented a contribution on the subject. It is one that has

Victorian standpoint, and demand investi
variation when found in New South Wal

The difficulty of defining what is a spec indeed in any large and variable genus very easy to make very serious mistakes ought to be kept separate, or in the case giving specific rank to mere varieties.

A curious example of errors that ma sound knowledge is acquired I find in a R Governor by Mr. William Swainson, F gentleman divided up what he called th seven genera and 1520 species and variet *Casuarina* he found 213 species, some of to leave unnamed, having exhausted his difficult species of *Eucalyptus* are probal fruits, for there is then so little opportun tinguishing characters, and it is only by ta of buds, anthers, fruits, leaves, seedling perhaps the wood itself that anything arrived at.

What an opportunity is here for some the old country which spends itself on mo variable genus of Compositæ! What scope exists in the study of the variation of veg continent like our own, which has been a destructive and thinning out action of

have induced them to take up their residence outside New South Wales. Messrs. Brazier and Whitelegge have also resigned from the Council.

We have to deplore the loss of our oldest Honorary Member, Baron F. von Mueller, who was elected on the 22nd January, 1876. To this event I shall take the opportunity of referring presently.

The distinguished Algologist, Professor G. B. Toni, of Padua, has been elected an Honorary Member of the Society.

In accordance with the resolution passed at the beginning of last year, a sound investment having been found for the funds left by the late Sir William Macleay, the Council took steps to invite applications in England and the Colony for the position of Macleay Bacteriologist. Five applications were received, but after considering the qualifications of the applicants, the Council has decided not to appoint any of them, but to give a wider publicity to the Society's requirements and advertise afresh later on with a view to obtaining a better selection. In the meantime, the principal will be increased by the year's interest, so that pecuniarily the delay will not be a loss.

Baron F. von Mueller.

I must now take the opportunity of saying a few words in tribute of respect to the memory of the late Baron F. von Mueller, whose friendship and good qualities many of us learnt to appreciate.

I do not intend to offer a lengthy account of the Baron's life, as that has already been done by others far more fitted to the task than myself. I may refer to the interesting account given in the "Sydney Mail" of the 17th October last, written some time ago by the late Rev. Dr. Woolls, and to that published in the "Victorian Naturalist," (No. 7, Vol. xiii.), which is due to the able and sympathetic pen of Professor Baldwin Spencer.

Baron F. von Mueller is a fit compeer of such men as Robert Brown, Dr. Hooker, and Mr. Bentham. He was a man of indomitable energy and perseverance, and during his 44 years of official life he achieved such results as few can boast of.

diately set himself to prosecute his favo In 1852 he was appointed Government Bo was thus enabled to commence his investig part of Australia which was untouched b that time he commenced a series of most a Australian Alps and elsewhere, often unat meant in those days can be imagined only of this country now living who have b inhospitable character of the Australian connected with it. In 1855, one of the m was made; he then accompanied Mr. Gre north-west of Australia, and the expeditio time of the recent Horn Expedition stood its valuable scientific results; and in gener ance of discovery it was second only to Le

In the earlier part of his career Baron F in the field and had opportunities of st habits of living plants which later in life

Included in the vast collections whic carry out that unique work, the "Flora complete continental Flora written, were cases" of specimens collected or forwarded and to his assistance was the success of There are now more than double the spe described compared with those known to Bentham in his eulogy on Robert Brow

indation has been laid for the carrying on of the study of rious important groups, and among the most interesting of the ojects to which the Baron devoted his attention are those of iera and orders possessing in Australia peculiar characters and ming often a special feature of the flora. I refer in particular his Monograph entitled "Eucalyptographia," consisting of criptions, with plates, of 100 species of the genus Eucalyptus, to the series of illustrations of Acacia, consisting of 13 des or 130 species, Salsolaceæ of 9 decades or 90 species, and andolleaceæ 1 decade only. A work on the Myoporineæ conng figures of a large number of the species of *Myoporum* and *iophila* was also begun and one volume completed. When it onsidered that there are probably at least 150 species of *ılyptus* and that only 100 are given in the "Eucalyptographia," that out of more than 300 species of the genus Acacia only are figured, it will be seen that a large amount of work ins to be done with those groups alone.

ie Baron's note on *Boronia floribunda*, read at the meeting iis Society on September 30th last, is believed to be his last itific contribution.

fitting memorial to the late Baron would be the publication a supplemental volume to the "Flora Australiensis." he took so important a part in furnishing material for the n existing volumes, it would be a graceful tribute to his iory to dedicate the supplement to him. This work should ourse be carried out on the lines and according to the same em as that adopted in the "Flora," which, whatever its ctions may be, has very much to recommend it, not only on unt of its being that made use of in the "Genera Plantarum," chiefly because a supplement could only thus be of real ty. It would, however, be a convenience if at the end of the me a reference in tabular form to the system and nomenire of the Baron's Census were supplied. It is to be hoped in whatever way the work may be carried out, all jealousies be laid aside and the greatness of the man to whose memory ribute is offered alone remembered. This volume might well

I should now like to add a few words
clature, but I do not wish that these rem
any way as disparaging to the late Bar
has a right to his own views, and certain
late leading botanist of Australasia, but
with him on certain points, and some
methods during his lifetime will probably
in now throwing off the restraint previo

Many of the well known names of the
were dropped by the Baron and do not
places in his "Census of Australian Plan
he considered to have the right of pri
adopted by him, to the great discomfort
one large genus, many generic names wit
have been grouped For example, such
lium, *Asterolasia* and many others are thr
Astroloma, *Leucopogon*, *Melichrus*, *Acrot*
and a host of others are suppressed and
Styphelia. The annoyance is great enoug
up you miss its generic designation, but i
you lose the specific name as well, it is con
Priority should not be the only guide
but use must be taken into consideratio
in his Address to Section K of the Bri
Advancement of Science. 1895. savs that

hout grave and solid reason;" and in a note he calls atten- Darwin's saying, "I cannot yet bring myself to reject any nown names." No doubt the Baron thought he had grave solid reason to change some names, and we should be loth to rge him with loitering on his errand like the schoolboy, but I sure all of us prefer the names we became used to through e "Flora Australiensis"; let us therefore adhere to them as nuch as possible.

Mr. R. D. Fitzgerald's "Australian Orchids" consisted at his death of one Volume of seven parts, and four other parts towards a second Volume. One hundred and eighty-three species were figured and described, with interesting notes on their habits and modes of fertilisation by Mr. Fitzgerald himself. Seeing the number of fine drawings still unused, it was proposed to continue the publication. The assistance of Mr. A. J. Stopps was secured for the lithographic work, and I was asked to work up the text. Many friends came forward to help with information, and Part 5 of the second Volume was brought out under the editorship of Dr James Norton in 1895. About half the plates equired for Part 6 and some notes for the text are ready, but here is no money to go on with the publication. Only a small um is really necessary to complete this part, but the Government eadfastly refused last year to place any money for the purpose the Estimates. It will be a great pity if this part cannot be lished, and also Part 7, which would make up the second olume. I hope a renewed effort may be made some day to duce the Government to provide the requisite funds for carrying t this essentially Australian object.

One of the scientific events chronicled for the past year is the effectual attempt to execute a wish of Charles Darwin to pierce coral island to its foundation and, by bringing up a core, test e mystery of its origin. A committee appointed by the Royal ciety of London for the purpose of this investigation had a an-of-war placed at their disposal by the Admiralty. The ew South Wales Government further assisted them with a loan

he time of year, to be given up before its main object had n attained.

News has just been received that another scientific excursion the Pacific has met with some success. After enduring con-erable toil, hardship and danger, Dr. Willey has, in the Loyalty nds, succeeded in obtaining eggs of the Nautilus, but unfortu-ely these have failed to develop.

. remarkable discovery in morphological botany has recently ı made in Japan of another connecting link between flowering flowerless plants. The discoverers are Professor Ikeno and Hirase, who have found in *Cycas* and *Ginkgo* the fertilisation ie ovule effected by a partial penetration of pollen tubes, and bsequent development of antherozoids for the completion of process.

'ith regret we learn from "Nature," of February, 18th, that veteran palæontologist and botanist, Baron Constantine von ngshausen, had died at Graz at the age of 71.

Horn Expedition.

ı my Address of last year lengthy reference was made to the instalment of the "Report of the Horn Scientific Expedition Central Australia"—Part ii. Zoology, then just published. ıe additional parts—Part i. Introduction, Narrative, Summary, with Map, by Professor Baldwin Spencer, M.A.; Part iii. logy and Botany, by Professor Tate, and J. A. Watt, M.A., :.; and Part iv. Anthropology, by Professor Stirling and Mr. en—have since been issued under the able editorship of 'essor Spencer, completing this important work. The Report s complete form, as a contribution to Australian scientific ature, has fully justified our expectations of its importance, it demands a further expression of our indebtedness to Mr. n, the promoter, and to all who have shared in its production. very substantial increase of knowledge in all departments been gained, but Professor Spencer has so ably summarised results that it is needless to attempt a re-summary. I will ely refer to his remarks on the relations of the Autochthonian

to see how, if the autochthonian has been mopolitan, representatives of typical Aust found, and not a trace of such doubtful for *Salix*, &c., upon the presence of which in fo of the cosmopolitan flora in Australia reall

Professor Spencer's "Narrative" is of have many narratives of Australian trave these have been written by the leaders o whose time and attention was necessarily tive details, and absorbed by the anxiety with these; but we have here a narrativ expert biologist, well versed in the subject of Australia, with a keen eye and a ready p work undistracted by drawbacks such as t And the work is rendered additionally attr series of topographical and other views r photographs. Nature was unfortunately i the opportunity of witnessing the advent circumstances attendant on a Central Au present themselves. Floods and drought taken as they come.

The experiences of the expedition ha Spencer opportunity for a masterly expo probable former relations of Australia, an special features of its botanical and z

in favour of a former land connection between South-
n Australia and South America, through what is now
nania, and thus adds his support to a theory, the objections
which are continually losing weight.

In my Address last year I pointed to the necessity of this connection in former times in order to account for the affinities of a portion of the floras of Australia, New Zealand and South America, and the occurrence in a fossil state in South America of marsupials allied to our own. The chief objections are—first, that an ocean of considerable depth lies between these countries, the bottom of which, it is therefore supposed, could never have been above the surface. As a matter of fact, even if Wallace's 000 fathom limit of possible elevation or depression could be knowledged, it is to be remarked that not enough soundings ve been taken in the higher latitudes to prove the non-existence submerged plateaux. The lowest continuous line of soundings ms to have been made by the officers of the Challenger; it lies ır latitude 50°, and there is to the south of that parallel nty of room for extensive plateaux to show themselves even quite shallow depths when soundings are taken. The er objection, that the temperature and climate would have ın too severe, can scarcely have weight. In the early and ddle Tertiary mild temperatures existed in the northern hemiıere up to latitude 79° in Spitzbergen, and $81\frac{3}{4}$° in Grinell nd, and there is no reason why, at the same epochs, if the position of the land was suitable, there should not have been nperatures favourable to life in the corresponding latitudes ar the south pole. Fossil remains from the Straits of Magellan licate tropical conditions. During the Pliocene, temperature nerally became lowered, and the vegetation of the temperate ne had begun to retreat from the North Pole; but even if the me process took place at the South Pole, there might still be undant warmth between, say, 55° and 70°, to permit of the istence of a luxuriant vegetation and fauna.

confirm me in the opinion I last year expre
flora would find its representatives in the ex
tion. Some of the fossil fruits of the Plioc
closely resemble those of to-day on the coast,
been almost entirely lost, there is not that
would like to find. It seems, however, qui
seeking for analogies in distant countries
with the existing flora should be made, and th
that the eminent palæontologist, in whose ha
remains from Dalton, Vegetable Creek and
adopted. Taking into consideration the dif
Eocene and Miocene climate and that of the
might expect to find existing types a few de
in the fossil state, but that is quite a differen
the other side of the earth for analogies.

I can find little or no information about
floras of Western Australia, South Africa a
This is much wanted, as also further infor
remains of the tertiary beds of Kerguelen Isl

Some months ago, when on a visit to Sout
H Wright took me to some leaf beds lying
the "Lower Basalt." The most interesting fi
were leaves in all respects resembling those of a
"domatia" and all. This is a curious indica
of these peculiar structures. *Eucalyptus* w

ɔugh the kindness of Mr. R. L. Jack, Government Geologist ensland, I have received a number of samples from the ɔeds, referred to in my Address of last year. The impres-re very fragmentary, and thus very difficult to make out. em to me as a whole to be rather conspicuous for the scarcity ılypts and Proteads as we know them, a circumstance ıs I have already indicated, we need not be at all surprised

AFFINITIES OF THE SOUTH AFRICAN FLORA.

belief in the former connection between Australia and merica is continually obtaining more adherents, but the ty of a land bridge having ever existed between South and Western Australia is treated with much greater lity. The affinities of the existing floras, however, seem t to it as the only possible explanation. Strong evidence nnection in the Carboniferous Period has already been l by Dr. Blandford and others, on the ground of a common hich flourished not only in South Africa and Australia, Southern India and South America as well.

we not this evidence from Carboniferous times, we must ledge that the resemblance between the existing floras of :h-west region of South Africa and that of Australia, and arly of Western Australia, is too remarkable to be ed for by saying that they are relics of a once cosmo-flora, and that their peculiarities have been produced by ctive action of the floral climates. Those botanists who ɔsely studied them would not be contented with any other tion than that of actual land connection, or at least of a tolerably close proximity of the land areas, after the ities of the flora had become developed. Strips of deep r separate the two countries, but it does not follow that as never any land bridge between them. It is certain ırts of the ocean where now there are depths of 1500 s have been land in the Miocene—for example, that from ealand northwards. Could we not allow of a local sub-

his Introduction to the "Flora of Tasma
additional particulars from Dr. Harry Bolus'
Handbook" will be of interest.

The region over which the Proteaceæ are
they are practically confined, is the south-
narrow strip about 400 miles long, extendin
Cape Town to Port Elizabeth, when it g
merges into the tropical African region. T
latter region, like the luxuriant vegetation o
extends southwards from the tropics far int
The width of the south-west African regio
miles on the average, and its northern boun
defined one. To the north is the Karroo
remarkable one also as will be seen. The f
region is characterised by abundance of
Ericaceæ, Proteaceæ, Restiaceæ, Leguminos
The Karroo region which adjoins it on the
complete absence of the orders named, an
Leguminosæ. The other regions of South
Mr. Bolus are the Composite and the Kala
interest us to the same extent.

South Africa is, in Mr. Bolus's paper, a
by the Tropic of Capricorn. It exhibits
variety of plant life, and a comparison wi
some remarkable analogies :—

ıe south-west region possesses the following orders in the test abundance :—

1. COMPOSITÆ.	8. CYPERACEÆ.
2. LEGUMINOSÆ.	9. RESTIACEÆ.
3. ERICACEÆ.	10. LILIACEÆ.
4. PROTEACEÆ.	11. ORCHIDEÆ.
5. IRIDEÆ.	12. RUTACEÆ.
6. GERANIACEÆ.	13. SCROPHULARINEÆ.

comparison with the most abundant Australian orders shows *Irideæ*, *Geraniaceæ*, *Restiaceæ*, *Liliaceæ*, *Rutaceæ*, and *Scrorineæ*, although existing, are not so prominent, and would to take a lower place, and the orders *Myrtaceæ* and *Goodeæ* would be substituted. The order *Ericaceæ* is represented e closely allied order *Epacrideæ*.

.th regard to the other orders, it is to be noticed that *aceæ*, although not so abundant, are peculiarly Australian; the suborder *Boronieæ* of *Rutaceæ* is peculiarly Australian, the *Diosmeæ* of the same order in South Africa; and that g *Liliaceæ* there is a peculiar genus—*Nauolirion*—which is y allied to *Herpolirion* of Australia, Tasmania and New ınd.

.e study of geological phenomena and the distribution of life on arth lead to two important conclusions: *first*, that the earth's ce has been subject to repeated and extensive deformation, ying a considerable amount of flexibility of the earth's crust, eby the land connections have been varied at different times; *secondly*, that over portions of the earth's surface extraor-y changes of climate have taken place, so much so that ıl and temperate, subtropical and even tropical conditions ar to have become interchanged.

PERMANENCE OF OCEAN BASINS.

spite of the undoubted truth of the first of the above pro-ions, the theory of the permanence of ocean basins and nental areas holds still a very strong position in the minds

of many. The chief argument in its favour lies in the supp
absence of deep sea deposits on dry land.

Speaking on this subject, Professor H. Alleyne Nicholso
his Presidential Address to the Royal Physical Society of E
burgh, 1894, points out that the deepest deposits are necess
thin, scanty and of limited area. Radiolarian deposits, whic
supposed to indicate deep sea, have been discovered of va
ages. In Lanarkshire they are accompanied by green an
mudstone, a forcible reminder of modern deep sea deposits.

Professor David's observations tend to shew that radio
deposits do not necessarily indicate deep sea. Probably in
case we should have to judge by the circumstances under whi
Radiolaria are found, and it is to be remembered that land
and vegetable débris may be found mixed with deep sea de
in the most incongruous manner. The dredging oper
between the west coast of Central America and the Gala
carried out between February and May, 1891, with the
Fish Commission steamer Albatross, under charge of Alex
Agassiz,* showed together with characteristic globigerina
a large amount of decayed vegetable matter. Terris
material was dredged up from depths of over 2,000 fathom
with it logs, branches, twigs, and decayed vegetable matter
the West Indies immense quantities of vegetable matter ha

ously at variance with what Mr. Marr was saying at t the same hour of the same day in a neighbouring hall. ilton's statement is an expression of the theory of the ence of ocean basins and continental areas, and it is that more nor less. It is desirable therefore to inquire what t. As it stands, it is a general statement too vaguely put much use. Does it mean that the whole of the great isins and the whole of the continental areas have always the same relative positions? Clearly not, for we know rly or quite all existing land has at some time or other der the water, and there have been land connections where now sea. The proposition must then be reduced to this, *tions* of the great ocean basins and *portions* of the con- areas have occupied the same relative position. In other ome portion or other of the great ocean basins has always der the water and that some portion or other of the continental areas has always been above the sea. The it thus corrected is useless to us; it affords no explanation istribution of life on the earth, for it may be true that eas of existing land and water have always been land and spectively, and yet we know that continental areas have ferently divided and cut up, and the same is the case with . If it was intended to mean that the continents and ad been practically the same through all time as they are is incorrect. For example, we have very good reason study of the flora to believe that in Permo-Carboniferous uth Africa, Southern India, Australia and South America part of one continent, and that in the early Tertiary North and South America were broken up into quite land masses, and that in the same period and earlier and Western Asia were indented and crossed by seas in a would make that part of the world quite unrecognisable

. E. Marr in his opening address to Section C (Geology) ritish Association, 1896, says:—"We have been told that tinents and ocean basins have been to a great extent

permanent as regards position through long geological age now reply by pointing to deep sea sediments of nearl geological periods, which have been uplifted from the abysses to form portions of our continents; and as the res study of the distribution of fossil organisms we can point as confidently to the sites of old continents now sunk down the ocean depths. It seems clear that our knowledge causes of earth movements is still in its infancy and th must be content to await awhile until we have further in tion at our disposal."

Captain Hutton says: "We know as a matter of fac continental areas are liable to subsidence, and that oceanic are liable to elevation; and we cannot as yet place a li the possible amount of continental depression or of elevation."* Further on (p. 411) he says:—

"We certainly do find a large number of geological represented in Europe, Asia, America, Australia, and Zealand, but in all cases there are also long periods un sented, especially in the Palæozoic era, when there are physical breaks in continuity, accompanied by an almost co change in animal life, and Sir A. Ramsay says that these may each indicate a period of time as great as the vast acc tions of the whole Silurian series. The question is, Wh

Kelvin and Mr. G. H. Darwin, from a study of the long ceanic tides, conclude that the earth's mass as a whole is gid than steel but not quite so rigid as glass. Such a of rigidity would at first sight appear to preclude any n of the levels of the land with respect to the ocean; , however, that certain tracts of the earth's surface are d others falling, so that the question arises what such nt of rigidity implies.

. L. Woodward in a paper entitled "The Mathematical of the Earth," published in the American Journal of Vol. 138, p. 343, says:—"Whatever may have been the nt condition of the earth's mass, the conclusion seems ble that at no great depth the pressure is sufficient to wn the structural characteristics of all known substances ce to produce viscous flow whenever and wherever the ference exceeds a certain limit, which cannot be large in on with the pressure." Internal fluidity is therefore not ry condition to account for movements of the crust.

considered that geological phenomena were best d by postulating a solid nucleus with a zone of fusion g the crust from the nucleus.

paper entitled "An elementary proof of the earth's ' published in the American Journal of Science, Vol. 139, he author, Mr. George F. Becker, points out that although is a very rigid body, it does not necessarily follow that l. The assumption of solidity is objected to by geologists ed to the possibility of the occurrence of geological na. There is, however, no conflict between geology and He says:—"Time enters into the expression of , and the fact that the earth behaves as a rigid mass to which changes its direction by 360° in 24 hours is not ent with great plasticity under the action of small forces maintain their direction for ages. For a considerable of years I have constantly had the theory of the earth's in mind while making field observations on upheaval and

subsidence, with the result that, to my thinking, the pheno are capable of much more satisfactory explanation on a solid than on an encrusted fluid one "

Changes of Climate.

The changes of climate, which occurred in the Carboni period, if the phenomena are rightly interpreted, are much extraordinary than those of the Pleistocene when the so Glacial period or periods set in, for the latter appear to been chiefly due to a general cooling of the poles and sequent enlargement of the ice caps The latter phenome visible both in the northern and southern hemispheres, w the glacial action which appears to be traceable in the C iferous period extended over Southern India, South . Australia and South America only. At this time Dr. Blandford (Part 2, Vol. xxix. of the Records of the Geo Society of India) says that these countries formed a con judging from the peculiar flora which characterises them each case a boulder bed "undoubtedly glacial in origin ' ha found associated with them. Dr. Feistmantel states th *Lepidendron* flora was swept away at the ushering in of tl conditions and gave way to the *Glossopteris* and *Gangam* flora He shows that a shifting of the pole woul l not a

ertain districts only over this large area, can these local conditions be considered to have been sufficient to produce a complete hange in the flora? Mr. Dubois in "The Climates of the eological Past," attributes the alteration to a general raising of he land, but it still seems rather strange that all the land should e raised, and although coal was still formed, no suitable positions hould be left for the old flora. He says:—"Just as during the arboniferous Age an extensive lowland, cut up by the sea into a arge marshy archipelago, accounts for the formation of coal over early the whole of the northern hemisphere, to such an extent hat comparison can only be made with the extensive deposits of urassic coal, extending from Western Asia to Australia, it seems hat a large mountainous continent ("Gondwána Land" of uess), at the south of the equator, has caused extensive accumuations of ice in suitable places. A great uniformity of orographic onditions over extensive continental parts of the earth's crust eems to have been characteristic of the Coal period. It is thus possible, and even probable, that by a gradual upheaval of such a continent, the changed conditions of existence caused the levelopment of a new flora, which only much later, in the beginning of the Mesozoic period, should find in Europe, in the higher upheaval of the ground, conditions it was better fitted for than was the older Palæozoic flora which in consequence would suffer extermination. Traces of glaciation are believed to have been actually found in the Permian formation of Europe. From those high centres of acclimatisation the new flora, accommodating itself to a higher temperature, could then have gradually spread over the lowlands."

Up to quite recently there were, and perhaps even at the present time, there are geologists who hold that the Glossopteris Flora belongs to a much later period of the world's history than the Lepidodendron Flora of the Coal Measures; but representatives of the two floras have been found associated in the same beds, which must be accepted as a final and conclusive proof of their contemporaneous existence. (Rec. Geol. Sur. of India, Vol. xxix. Part 2, p. 58).

The most important and tangible of t
in the northern hemisphere are those of th
is called, in the title of Dr. James Geikie's
of the earth, the north pole at least, wa
end of the Tertiary Period, and the c
Pleistocene. Dr. Geikie says that at lea
can be proved during which the cold adva
between which mild conditions prevailed.
these to be less in number.

Various explanations have been given f
conditions from the pole, the most note
known as Croll's theory. Dr. Croll argu
earth, in consequence of the varying posi
the planets, increases in eccentricity at
hundreds of thousands of years. The
in one of these periods. High eccentricit
of the earth was inclined in the line of the
cause long mild summers and short winter
short summers and long cold winters in
latter conditions, great cold and accumula
what is called a glacial period would resu
of the equinoxes, the conditions would al
and southern hemispheres till the orbit
extreme eccentricity.

ng of surface weights not easy to understand." (Great Ice Age, Note p. 791).

Sir Charles Lyell considered that all climatic changes could be 'xplained by gradual changes in the distribution of land and 'ater. There are few that now hold this view. It is to be 'marked that in Pleistocene times the distribution of land and iter was practically the same as now, and yet it was just in at period that the most remarkable oscillations of temperature nditions occur.

Dr. Geikie in the work already referred to points out that re are oscillations of temperature and rainfall shown by 'ance and retreat of glaciers, rising and falling of level of lakes l inland seas, and asks whether these may not be due to cosmic ses, and whether such causes may not have to do with the ger and more extensive oscillations producing glaciation or d temperatures up to near the pole.

As regards the question of the geographical shifting of the pole, nd in "Nature," of September 25, 1884, a letter by Mr. Flinders trie referring to an Address by Professor Young, which stated it a change of one second per century had been noted at Pulkowa the earth's axis. Other corroborations of the same fact exist. says:—"Such a change might be effected by causes which beyond our observation; as, for instance, unbalanced ocean culation equal to a ring of water only 4 square miles in section ving at a mile an hour across the poles." Mr. Petrie refers to Gizeh Pyramids; these structures, the errors of which are t a few seconds of angle, agree in standing as much as 4′ or 5′ the west of the present north.

Professor Newcomb some years ago, from observations of the insit of Mercury, concluded that the rotational period of the th was not a fixed quantity, and it has since been amply shown m the study of the same phenomena that the period is subject variation, increasing for a number of years and then diminish- again, and so on. I do not know whether any explanation been offered of this phenomenon, but may it not indicate

movements of the viscous interior, more or less independent that of the crust?

Some of the peculiarities of the distribution of temperatur the Tertiary seem to be more easily explained on the assumpt of a geographical shifting of the pole, and as a slow shift seems to be going on at the present moment, it may be lool upon as helping to solve the difficulty.

Mr. Marr says in his Address previously referred to that Neumayr in his work (Ueber Klimatische Zonen wahrend Jura und Kreidezeit) has, in the opinion of many geolog established the existence of climatic zones in former times. may be the best way of testing any supposed extensive shif of the pole, although it is to be observed that up till the Tertiary actual polar conditions must have been confined t very few degrees round the pole, and may be, therefore, diffi to identify.

With regard to the possible geographical shifting of the a it has seemed to me that somewhat extensive changes could l taken place in former times when the earth was less rigid the interior more closely resembling a fluid, in the follov manner. We believe that the rotation of the earth is being sl but surely retarded by the action of the tides. If the inte were fluid or thinly viscous, the retardation of the crust w

ɩ general alteration of climate over the surface of the earth
ht be caused by an alteration in the constitution of the atmos-
re. Mr. H. C. Russell at a meeting of the Royal Society of
w South Wales in 1892 pointed out, when giving some
ticulars of probable life conditions on the Planet Mars,
t the existence of a thin layer of olefiant gas in the
osphere of this planet would allow the sun's heat to enter, but
ld prevent its radiation again into space, so that the existence
he addition of small quantities of such a gas if liberated by
ensive volcanic disturbances from coal strata below would be
cause of materially raising the general temperature of the
h's surface. On the other hand, if the earth with the sun
sed into regions of space which happened to be crowded
h meteoric matter, the power of the sun's rays would be so
ch diminished that a considerable enlargement of the polar
a and an extension of glacial phenomena into temperate regions
ld result.

n "The Climates of the Geological Past," Mr. Eugene Dubois
ws how that in all ages up to the end of the Tertiary Period
d temperatures have been proved to exist up to within 10 or
degrees of the North Pole, and in the Eocene we have such
Grinell Land at 81¾° N., 95° W.; Spitzbergen 77½° to 79° N.,
ut 20° E., while in the Island of New Siberia in latitude 75½°
l 140° east longitude deposits of brown coal are found. In the
thern hemisphere it has not been possible to penetrate so far,
in Kerguelen, which now has a rigorous climate, *Cupressoxylon*
been found, while at Punta Arenas, in the Straits of Magellan,
° S., the conditions appear to have been tropical. The author
curs with Heer in disputing the fact of any indication of geo-
phical shifting of the pole, as the vegetation follows close on the
e all round, and if the ancient conditions seem to have been
mer on the Atlantic side, it is only similar to what is the case
. In the early Tertiary especially this intensity of conditions
lucing warmth might well have been even greater than now, as
ope consisted of islands and peninsulas, with inland seas and
ge bays, and there is little doubt that the Arctic Ocean was at that

and part of the Tertiary it was a white star, th
ditions were more intense; and although the tro
been hotter, the heat would be better distrib
poles. He points to the more ancient typ
animals (reptiles) as requiring warmer condit
blooded mammalia and birds are adapted to the
now prevailing.

As a rule every writer looks to his own th
sufficient, whereas probably there has been
conditions producing the effects, so that not onl
that the reduction of the sun's radiating power m
to do with the present less favourable conditio
of the intermediate changes may have been
various causes—namely, small shiftings in
position of the earth's axis, increase in the e
orbit, to some extent by an alteration of the di
and water and the induced air and ocean cur
cosmical causes and intercepting of the sun's hea
stellar matter.

Insular Floras and Oceanic Is

This subject is one the consideration of
separated from that of the permanence of ocea

Wallace divides islands into three classes:—
islands, ancient continental islands and oceanic

wanted to permit of a connection in the past of the remotest group of islands with the mainland.

There seems to be an argument in a circle as far as oceanic insular floras are concerned. First of all it is assumed that if the depth is over a certain amount—say, 1000 fathoms—former land connection was not possible; then comes the study of the flora and fauna of those islands which are thus situated, and those are then looked upon as characteristic of such islands—other islands have these characteristics—the conclusion is drawn that they also have never been connected with the land.

I shall not attempt to prove that important oceanic groups like the Sandwich Islands and the Galapagos Islands were once connected with any of the continental areas. I leave that to abler debaters than myself—like Captain Hutton and Dr. von Jhering—but I wish merely to draw attention to some of the difficulties that the holders of the oceanic insular theory have to contend with.

First let me say that there are many islands, formerly held to be oceanic islands, which are now acknowledged to have had a former continental connection—such as New Zealand, the Fiji and the Solomon Islands. Atolls and coral islands, and some islands of volcanic origin are probably acknowledged by every one to be truly oceanic, and about these there is no dispute. The difficulty lies in the determination whether such groups as the Samoan, Tongan, Marquesan and other groups of the Western and Central Pacific, the Sandwich Islands, Galapagos and some detached islands like Pitcairn and Easter Islands come under this category.

It is well known and acknowledged that there are about 200 species of plants the seeds of which stand immersion in salt water for a certain time, and are, therefore, capable of germination if thrown up by the sea on to a favourable spot, and out of these there is a smaller number which do not lose their germinating powers after prolonged immersion. Then, again, there are some seeds with a hard testa surrounded by pulp, which, after being eaten by birds, may be conveyed to islands at short distances, or perhaps for 50 or 100 miles, as the birds may be in the habit of

visiting them. There are also plants which have extremely lig
or small seeds, or, as in the case of most Compositæ, possessing
pappus, by means of which they are borne by the wind over lo
distances. Again, there are seeds with barbed hooks which m
adhere to the feathers of birds, or others of small size produced
plants growing on the margin of water or elsewhere which may
taken up with particles of mud, and be thus conveyed over consi
able distances. But when this list is exhausted there are still m
plants growing on the larger islands the presence of which ca
be accounted for.

In the Hawaiian or Sandwich Islands, according to the
Dr. Hillebrand's investigations, there are 999 specie
phanerogams and vascular cryptogams. After deducting
this number the usual littoral and drift species, and n
useful and ornamental plants probably introduced by the nat
and even allowing a margin for endemic evolution of new spe
after introduction of those from elsewhere, it must be ack
ledged that a great power of belief is required to satisfy one
the balance are all introduced.

The situation of the islands is this :—They are 2,040 r
from the coast of America, 1,860 from the Marquesas, and 2
miles from Tahiti. It can be seen how small a chance the
for winds, waves and birds to bring together the

). Bog flora of high table land of Kauai, and of the broad top of Mt. Ecka or West Maui. Here are representatives from Antarctica (New Zealand, Falkland Islands, Southern Andes, &c.).

It is to be noted that there are 40 endemic or peculiar nera, one of which is the curious Lobeliaceous tree *Sclerotheca*.

It is most difficult to understand how winds, waves and rds could have combined to bring the seeds of all these plants gether and pop them down just on the right spot where germition could take place.

The Galapagos Islands are another example; but here the stance from the mainland is much less, and the number of ecies smaller, so that the possibility of accidental introduction largely increased; but it is curious that the different islands ssess different species, and those chiefly distinct from the ainland. This remark applies to the land snails as well as the ants.* The affinities of the endemic flora are entirely American. few plants such as *Lipochæta laricifolia*, have congeners in e Sandwich Islands, and not in America, but the arboreous obeliaceæ are absent. There are only five species noticed mmon to all islands, two species in four islands, and six in ree, according to Mr. Botting Hemsley's account in the "Botany" the Challenger. If species have drifted from the mainland, or en conveyed by birds or otherwise, why should the same species t have been conveyed to all islands, or those on one island not ve been transferred to the others?

The floras of the larger islands of the south-western Pacific have lecidedly Malayan character, and there is not the development endemic genera which would lead to the certain conclusion that islands were relics of a former more extensive land area.

In the "Botany" of the Challenger Expedition, p. 68, there is interesting and instructive remark on the Flora of the Eastern

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See Mr. Dall's paper in the Proc. Acad. Nat. Sci. Philadelphia, 1896, 395.

Pacific Islands, which runs thus:—"The Australasian *Metrosideros* penetrates as far eastward as Pitcairn, where the Sandwich Islands, it forms large woods; and the promi of such other Australasian or Asiatic genera in the Sand Islands as *Pittosporum*, *Alphitonia*, *Cyathodes*, *Scævola* *Cyrtandra* is noteworthy. On the other hand, the peculiar S wich Island types seem to have had a former wider extensio is indicated by the Lobeliaceous arboreous genus *Sclerotheca* a species of *Phyllostegia* in Tahiti."

When treating of Tristan d'Acunha in the South Atlantic Botting Hemsley says (Appendix, p. 313)—"Whether present distribution of *Phylica nitida* was brought about b agency of birds is highly problematical. The distribution c genus, like that of many others of the African region, rather to a former greater land connection."

The scientific methods of the present age, starting with D and Wallace, have been chiefly directed towards discreditin miraculous and catastrophal, and towards accounting f phenomena by means of existing mechanical causes. Th method of explaining facts is admittedly unscientific, but are w tempted under modern methods to press the argument just a too far the other way; and having found, for instance, that plants, and even some animals, can be dispersed by winds, w

the fact by suggesting that reptiles have some unknown
ceptional powers of dispersal. But if so, why is the
nenon limited to Polynesia? And why should Mr. Wallace
f explain the small number of reptiles in Great Britain and
d by the supposition that they are unable to cross the
h and Irish Channels?"*

results of the Challenger dredgings seem to show that the
al part of the Pacific was ocean during the Tertiary
but it is not impossible that chains of volcanic islands or
of land may have existed during or before that period and
ese, being of a shifting character, at first connected with
nent and afterwards cut off, might preserve the relics
ntinental fauna and flora. A continent properly so called
rcely have existed. The difficulties are too great in the
such a supposition, but only connections similar to that
we are certain existed between New Zealand, New
nia, the Fijis, and the main land which was perhaps at its
of greatest development in a state of oscillation need be
ed.

ain Hutton's theory of a bridge for the migration of
ials to Patagonia across the Pacific presents too many
ties, and my remarks above are by no means intended
port the idea, for the absence of relics on the road is a
argument against it. Neither on the islands nor on the
nd of Asia between Europe and the Malay Peninsula have
ent any fossil remains been found of those animals which
re represented in Tertiary Europe and Patagonia.

facts seem rather to point to the conclusion that the
lian Marsupials were derived either from an ancient and
led Patagonia or that the ancestors in both countries were
ped previously in some Antarctic region now submerged.

e ight on the subject of the former distribution of land
ater is thrown by Dr. H. von Jhering, who has kindly

* New Zealand Journal of Science, Vol. i. 1883, p. 411.

furnished me with a copy of his Treatise "Das neutropische F. gebiet und seine Geschichte," (Engler's Jahrbuch, 1893) This treatise deals with matters of special interest to us, and ther deserves notice in this place, but I find that I have not spa refer to it at the length which it deserves, and I must ther now confine myself to stating his main arguments, at the time recommending those interested to study the original The author sets himself to upset Wallace's axiom of the manence of continents and oceans which would, if true, that South America was always cut off from connection south-eastern Asia as it is at present, and he disputes the va of the assertion that the bottoms of oceans over 1000 fath depth could never have been dry land. He says that g depths only indicate longer time for subsidence The ef separation at different epochs would be that we should fi fauna limited to the groups which had reached their develo before then, and he points to the Pacific Islands, wher tertiary fauna are absent altogether, as proof of their is in Mesozoic times, while on the other hand lizards, ancient of mollusks and insects are found.

The author divides South America into three regions. northernmost has affinities with North America, the midd

became united, and an interchange of forms thereafter took place. The land connecting La Plata and Patagonia with South Eastern Asia he calls "Archinotis." He says the bridge between South America and Africa broke up before that between India and Africa, so that when the middle and southern South American regions became united no neotropical African types could migrate to Australia.

The author then discusses the various methods by which plants and animals are understood to be transported across the ocean, and throws doubt upon the whole theory of oceanic islands. Speaking of the island group of Ferdinand Noronha, he says, "It is certain that on the main island birds scatter the seeds of berries, fruits, &c., but when wind and birds do not cause the spread of the plants even from one island to another the distance of a gunshot, how can one believe that this means of distribution is effective across gaps of hundreds or thousands of kilometers?" The author disputes the fact of the Andean migration, he says there is not a species common to the Californian Sierra Nevada and the Andes. With regard to the exchange of plants of higher latitudes north and south of the equator, he is of opinion that formerly these must have been capable of existing in warm regions as well as in cold. Even now *Ranunculus*, *Polygonum*, *Stellaria media*, *Samolus Valerandi*, *Veronica anagallis*, *Parietaria debilis*, &c., are not sensitive to climate. He says that formerly plants were not so restricted by climate, so that the following genera are found together in the Upper Pliocene of Niederrad and Hochst am Main: *Juglans*, *Aesculus*, *Carya*, *Liquidamber*, *Corylus avellana*, *Betula alba*, *Picea vulgaris*, and the alpine *Pinus cembra* and *Pinus montana*. The author then discusses the distribution of various genera, *Podocarpus* and other southern *Coniferæ*, *Cocos*, *Nypa* and other Palms, *Cupuliferæ*, &c. He is of opinion that the completeness of the Indo-Australian territory must have been longer retained than the connection of Australia and New Zealand, and he says that if the genera *Canis* and *Sus*, the *Muridæ*, &c., could push into New Guinea and Australia, the connection with Asia must have lasted into the Miocene. During the whole

Tertiary period there was a constant change of mammals bet
North America and Europe, but it was not complete; prol
those that could not face a temperate climate could not
This might explain the fact of the *Anoplotheridæ* and *Th*
myidæ being found in the Argentine beds and Europe but t
North America. The author then discusses the fresh water
and finds the conclusion derived from their consideration to
with that deduced from the fresh water fauna.

THE SOUTH AMERICAN MAMMALIA—RECENT AND EXTIN

I cannot conclude my Address without making special ref
to the wonderful discoveries of fossil mammals recently m
South America. The importance of these discoveries to
that in this region not only placental mammals of very p
types have been found differing in important respects from
forms in other parts of the world, but that marsupials of dis
Australian affinities also occur. Here I should like to ref
most interesting find in Ecuador of a living animal of a s
type, and the proof that it is marsupial in character
this the only living representative in America was the O
(that is the true Opossum or Didelphys which belongs
Polyprotodont group). This new animal called *Cæ*
resembles the group of Kangaroos and Australian Op

r, because if the views as to the age of the beds and the ities of the remains are corroborated, Patagonia must have a centre of distribution of mammals not only for the Antarctic ns of the time, but also for Europe and, perhaps, North rica.

r. F. Ameghino shows that beds exist—red sandstones—aining remains of Dinosaurs and undoubtedly of Upper aceous Age. Above those and quite continuous with them s the Pyrotherium Formation, containing armoured and moured Edentates, peculiar Carnivora, Plagiaulacidæ, Hystri-rphous Rodentia, peculiar Ungulates and primitive forms of ates. Ameghino includes *Pyrotherium* among the Ungulates, considers it allied to the Proboscidea, but Woodward asks in e at the end whether it may not be allied rather to *Diproto-* Ameghino says that if these beds are not Cretaceous, then saurs lived in Patagonia until a more recent epoch than in portions of the globe.

bove the Pyrotherium Formation comes the Patagonian ation, which has been erroneously confounded with the ne formations of Parana. The mollusca of the Patagonian ation have been stated by D'Orbigny, Sowerby, Philippi, é, Remond de Corbineau and Steinman to be partly of Eocene partly of Upper Cretaceous Age. The objection to this quity is the presence of remains of Cetacea, which only ar in Europe during the Miocene, but F. Ameghino thinks group might well have originated earlier in the southern isphere, and says their remains are more primitive in type, as been recognised by Lydekker.

ext above comes the Santa Cruz Formation, which was at time supposed to be anterior to the Patagonian, on account e latter having been confused with the Parana. There are numerous remains of extinct mammals, gigantic birds and les. There are marsupials of the Diprotodont group, which the living *Cœnolestes* above referred to, and unlike the garoos, are not syndactylous. These are stated to resemble

Above this lies the Boulder or Tehuelche
Darwin has shown, is of marine not glacial o
to be of Miocene Age.

Later signs of geological phenomena are t
of Patagonia and the Pampean Formation, '
six or seven successive mammalian faunas,
of the mollusca that almost all the species l
of Brazil.

There are numerous plant remains in the
formation, and it is to be hoped that inve
may be made without delay.

Tertiary Plant Remains in A

Mr. T. S. Hall and Mr. G. B. Pritchard
unravel the difficulties of determination of tl
beds of Victoria.

Much confusion had previously resulted fro
of the position of what is termed the Older I
sidered Miocene by Professor McCoy, on
supposed to overlie beds of Miocene Age
Pritchard have shown this view to be erro
instead of being Miocene, to be early Tert
found to be overlapped by acknowledged ma

Underneath the Lower Basalt lie in var

Hall and Pritchard in the same paper suggest that the Dalton and Vegetable Creek, which have the same ıl character, and which Baron Ettingshausen considered ıay have to be referred back to the Cretaceous also.

Hall and Pritchard have written several valuable ıcussing the age of the Tertiary strata of Victoria, and . Wright has in the most painstaking manner investi- geological features of an area of Gippsland, and proved sequence of the beds, in some cases entirely reversing r received ideas. Unfortunately I am unable through me and space to enter into these matters as I should can, therefore, only refer to the papers read by those ı before the Royal Society of Victoria and Australasian ›n, and in the case of Mr. Wright's investigation, to the ·t of the Geological Survey of Victoria.

EST DICOTYLEDONS IN THE NORTHERN HEMISPHERE.

Report of the United States Geological Survey (Vol. xvi. ust received, there is a paper by Professor Lester F. titled "Some Analogies in the Lower Cretaceous of ıd America."

1888 the oldest known dicotyledon was one from the retaceous of Greenland, which was described by Heer name of *Populus primaeva.*

›r Fontaine in 1888 found in some of the Lower Potomac what was supposed to be Jurassic, some portions of leaves ; dicotyledons, but not easily distinguishable from the ıps, ferns, cycads and other gymnosperms.

Report to which reference is now made Professor Ward)n numerous occasions, dating as far back as 1878, I essed the opinion that the dicotyledons could not have ›rigin later than the Middle Jura, and it will not surprise final verdict of science shall place the Potomac forma- ast the lower member, in which the plants occur, with gic system."

lesirable to inquire of Mr. R. L. Jack whether it was not ible that the same condition existed on the coast side of the iding Range, and that thus the beds in question might really f Lower Cretaceous Age.

Ir. Jack's reply is as follows:—"I cannot see my way to ing the Oxley beds on a higher horizon than the rest of the vich formation. Stratigraphically it would not work. They an integral part of the formation which from top to bottom ls the assemblage of plants on which the Triasso-Jurassic of the whole was founded. They are pretty well up in the s, but what evidence there is is all against their being the ermost part or anywhere near it. I believe them to be *below* thick Murphy's Creek Sandstone and the Clifton Coals and les which give the same fossil plants as the shales associated the coal seams of Ipswich proper."

f Mr. Jack's views as to the age of the beds is correct, they t undoubtedly to the conclusion that at an age when European American dicotyledons exhibited a rudimentary or transition racter, the southern hemisphere already possessed types of development. Before this becomes an accepted fact, it is lless to say that some further corroboration of the conclusions o the correspondence in age of the so-called Jurassic beds of stralia and those of the northern hemisphere should be sought.

wish to take this opportunity of expressing my best thanks to ssrs. R. Etheridge, Junr., T. W. E. David, E. F. Pittman, R. L. k, T. S. Hall, G. B. Pritchard, J. H. Wright, H. C. Russell, J. Merfield, C. Hedley, R. T. Baker, H. C. L. Anderson, J. J. tcher and others for the assistance they have given me in the paration of this Address and that of last year by placing books l facts at my disposal.

On the motion of Professor Haswell, seconded by Mr. W. S. n, a very hearty vote of thanks was accorded to the President his interesting Address.

The subjoined financial statement for the year ending March st, 1897, was presented by the Hon. Treasurer, and adopted.

	£	s.	d.		£	s.	d.
one Associate Members	9	9	0	Stationery	3	13	0
Subscriptions from 78 Members	94	16	6	Postage (Hon. Treasurer's)	1	6	0
Interest received	2,670	15	4	Rent, Rates and Insurance	83	1	2
Sales of Publications, including 100 copies of Proceedings sold to the Government	109	5	1	Law Charges...	2	2	0
				Bank Charges for Collecting Cheques, &c.	0	13	10
				Petty Cash (Advertisements, Gas, Distribution of Publications, Postage, and Sundries)	30	0	0
				Salaries and Wages	478	0	0
				Dulau & Co., to cover advertisements for Bacteriologist	10	0	0
				Interest re-invested included in Loan C for £24,000	900	0	0
				Balance in Commercial Bank	974	14	10
	£2,935	15	6		£2,935	15	6

March 30th, 1897.

Audited and found correct.

Hugh Dixson
E. G. W. Palmer } Auditors.

James Norton, Hon. Treasurer.

TERIOLOGY BEQUEST.

INCOME ACCOUNT

	£ s. d.		£ s. d.
	1,440 0 1	Dalan & Co., to cover advertisements for Bacteriologist ..	10 0 0
	266 11 6	Balance covered by £600 (part of £24,000 Loan ( ), and £617 9s. 11d., part of £874 14s 1od in Commercial Bank	1,717 9 11
	20 11 5		
	£1,727 9 11		£1,727 9 11

[illegible] Auditors.

The following gentlemen were elected

OFFICE-BEARERS AND COUNCIL FOR 1897.

PRESIDENT:

PROFESSOR J. T. WILSON, M.B., CH.M.

VICE-PRESIDENTS:

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HONORARY TREASURER:

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THOMAS STEEL, F.C.S.
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AUDITORS:

HUGH DIXSON, J.P.
EDWARD G. W. PALMER.

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(1896.)

Names in Italics are Synonyms.

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

SUPPLEMENT TO PROCEEDINGS, 1896.

CATALOGUE OF THE DESCRIBED COLEOPTERA OF AUSTRALIA. SUPPLEMENT, PART II.

Dytiscidæ, Gyrinidæ, Hydrophyllidæ, Staphylinidæ, Pselaphidæ, Paussidæ, Silphidæ, Scaphididæ, Histeridæ, Phalacridæ, Nitidulidæ, Trogositidæ, Colydiidæ, Cucujidæ, Cryptophagidæ, Lathridiidæ, Mycetophagidæ, Dermestidæ, Byrrhidæ, Parnidæ, Heteroceridæ.

BY GEORGE MASTERS.

Family DYTISCIDÆ.

Sub-Family DYTISCIDES.

CANTHYDRUS, Sharp.

7581. BOVILLÆ, Blackb., P.L.S.N.S.W. (2) iv. 1889, p. 446.
S. Aust.; N. Territory.

Part ii. of the Catalogue is contained in Vol. x., Part 4, pp. 583-672 (published April 3, 1886).

The left hand number continues the pagination of the Catalogue; the right hand that of the Supplement.

Australia; widely distributed.

Sp. 968. H. AUSTRALIS, Clark = *H. Blanch*
l.c. p. 1000 = Sp. (probably) 1028, *Hyd*
Macl.; Sharp, l.c. p. 789.

Australia; widely distributed.

HYDROCANTHUS, Say.

7583. WATERHOUSEI, Blackb., Trans. Roy. Soc.
p. 65.

S. Australia.

STERNOPRISCUS, Sharp.

Sp. 999. S. MULTIMACULATUS, Clark = *H*
collis, Clark; Sharp, l.c. (2) ii. 1882,

S. and W. Australia.

MACROPORUS, Sharp.

Sp. 1022. M. GARDNERI, Clark = *Hydrop*
Macl.; Sharp, l.c. (2) ii. 1882, p. 996.

Australia and Tasmania.

Sp. 1024. M. HOWITTI, Clark = *Hydropor*
Sharp, l.c. p. 997.

Australia and Tasmania.

NECTEROSOMA, Macleay.

PLATYNECTES, Sharp.

1047. P. DECEMPUNCTATUS, Fab. = *P. lugubris*, Blanch., *Mastersi*, Macl., and *spilopterus*, Germ.; Sharp, l.c. (2) ii. 1882, p. 988.

Australia; widely distributed.

LANCETES, Sharp.

ULARIS, Lea, P.L.S.N.S.W. (2) x. 1895, p. 224.

W. Aust.; Donnybrook.

COPELATUS, Erichson.

1064. C. AUSTRALIS, Clark = *Celina australis*, Clark; Sharp, l.c. (2) ii. 1882, p. 564.

Australia; various localities.

RHANTATICUS, Sharp.

ATIPENNIS (HYDATICUS), Lap., Etud. Ent. p. 95; Aubé, Spec. p. 158; Sharp, l.c. (2) ii. 1882, p. 691.

Australia.

HYDATICUS, Leach.

SIMILIS, Régimb., Notes Leyd. Mus. ix. 1887, p. 224.

Queensland.

IYI, Aubé, Spec. p. 174 = Sp. 1114, *H. ruficollis*, Fab.; Sharp, l.c. (2) ii. 1882, p. 656, No. 1020.

Australia; N.S. Wales and Queensland.

ALLELUS, Clark, Trans. Ent. Soc. Lond. 1864, p. 219; Sharp, l.c. p. 653.

N.S. Wales.

1060. H. PULCHER (COLYMBETES), Clark; Sharp, l.c. p. 665.

Australia; widely distributed.

CYBISTER, Curtis.

7590. GRANULATUS, Blackb., P.L.S.N.S.W. (2) iii. 1888,
and 1393.
S. Aust.; N. Territory.

7591. TRIPUNCTATUS (DYTISCUS), Oliv., Ent. iii. 1795, p.
f. 4 = Sp. 1087, *C. gayndahensis*, Macl.; Sharp, l
1882, p. 1140; Olliff, Memoirs, Aust. Mus. ii. 18
Australia; widely distributed; Lord Howe Is

ERETES, Castelnau.

Sp. 1108. E. AUSTRALIS, Erich.—*Eunectes punc*
Macl.; Sharp, l.c. (2) ii. 1882, p. 994.
Australia; widely distributed.

Family GYRINIDÆ.

DINEUTES, W. S. Macleay.

7592. INFLATUS, Blackb., Trans. Roy. Soc. S.A. xix. 189
Victoria.

GYRINUS, Geoffroy.

Family HYDROPHYLLIDÆ.

HYDROPHILUS, Geoffroy.

7594. BREVISPINA, Fairm., Journ. Mus. Godeff. 1879, p. 80.
Queensland, Moreton Bay.

STETHOXUS, Solier.

7595. PEDIPALPUS, Bedel., Rev. d'Ent. x. 1892, p. 312.
Australia.

STERNOLOPHUS, Solier.

7596. TENEBRICOSUS, Blackb., P.L.S.N.S.W. (2) iii. 1888, p. 813.
N. Aust.; Palmerston.

HYDROBIUS, Leach.

7597. MACER, Blackb., l.c. (2) iii. 1888, p. 819.
Victoria.

Sp. 1142. H. ASSIMILIS, Hope; Blackb., l.c. p. 818.

HYDROBIOMORPHA, Blackburn.

7598. BOVILLI, Blackb., l.c. (2) iii. 1888, p. 816.
N. Aust.; Palmerston.

7599. TEPPERI, Blackb., l.c. p. 817.
N. Aust.; Palmerston.

7600. HELENÆ, Blackb., l.c. (2) iv. 1889, p. 741.
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PARACYMUS, Thomson.

7601. LINDI, Blackb., l.c. (2) iii. 1888, p. 821.
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7602. METALLESCENS, Fvl., Rev. d'Ent. ii. p 352.
Australia.

7603. NIGERRIMUS, Blackb., Trans. Roy. Soc. S.A. xiv p. 66.
Mountains of Victoria.

7604. NITIDIUSCULUS, Blackb., P.L.S.N.S.W. (2) iii. 1888,
S. Aust. and Victoria.

7605. SUBLINEATUS, Blackb., l. c. p. 821.
S. Aust.; Roseworthy.

PHILHYDRUS, Solier.

7606. BURRUNDIENSIS, Blackb., P.L.S.N.S.W. (2) iv. 188
S. Aust.; N. Territory.

7607. EYRENSIS, Blackb., Trans. Roy. Soc. S.A. xix. 189
S. Aust.; Eyre's Peninsula.

7608. LÆVIGATUS, Blackb., P.L.S.N.S.W. (2) iii. 1888, Trans. Roy. Soc. S. Aust. xv. 1892, p. 207.
S. Aust. and Victoria.

LACCOBIUS, Erichson.

7609. AUSTRALIS, Blackb., Trans. Roy. Soc. S.A. xiv. 189
Victoria ; Ovens River

BEROSUS, Leach.

APPROXIMANS, Fairm., Journ. Mus. Godeff. xiv. 1879, p. 82.
Queensland; Peak Downs.

AURICEPS, Blackb., P.L.S.N.S.W. (2) iv. 1889, p. 447.
S. Aust.; N. Territory.

DECIPIENS, Blackb., l.c. (2) iii. 1888, p. 827.
S. Aust.; N. Territory.

DISCOLOR, Blackb., l.c. p. 829.
S. Aust.; Port Lincoln.

DUPLO-PUNCTATUS, Blackb., l.c. p. 828.
S. Aust.; Adelaide, Port Lincoln, &c.

EXTERNIPENNIS, Fairm., Journ. Mus. Godeff. xiv. 1879, p. 81.
Queensland; Rockhampton.

FLINDERSI, Blackb., l.c. p. 831.
S. Aust.; Port Lincoln.

GRAVIS, Blackb., l.c. p. 826.
S. Australia.

MAJUSCULUS, Blackb., l.c. p. 824; Trans. Roy. Soc. S.A. xv. 1892, p. 207.
S. Australia.

MUNITIPENNIS, Blackb., l.c. xix. 1895, p. 30.
S. Aust.; near Lake Callabonna.

OVIPENNIS, Fairm., Journ. Mus. Godeff. xiv. 1879, p. 83.
Queensland; Port Mackay.

PALLIDULUS, Fairm., Journ. Mus. Godeff. xiv. 1879, p. 81.
Queensland; Peak Downs.

SIMULANS, Blackb., P.L.S.N.S.W. (2) iii. 1888, p. 832.
S. Aust.; Adelaide.

OCHTHEBIUS, Leach.

17. AUSTRALIS, Blackb., P.L.S.N.S.W. (2) iii. 1888, p. 835.
S. Aust.; Adelaide.

HYDRÆNA, Kugelann.

8. ACUTIPENNIS, Fairm., Journ. Mus. Godeff. xiv. 1879, p. 81.
Queensland; Brisbane.

9. TORRENSI, Blackb., l.c. (2) iii. 1888, p. 837.
S. Aust.; Adelaide.

CYCLONOTUM, Erichson.

). ABDOMINALE, Fabr. Syst. El. i. p. 94; Muls., Ann. Soc. Agr. Lyon, 1844, p. 179; Blackb., P.L.S.N.S.W. (2) ix. 1894, p. 91.
Queensland; Brisbane.

1. AUSTRALIS, Blackb., l.c. iii. 1888, p. 839.
S. Australia.

Sp. 1157. C. PYGMÆUM, Macl.; Blackb., Trans. Roy. Soc. S.A. xviii. 1894, p. 203.

CERCYON, Leach.

2. FLAVIPES, Fabr., Ent. Syst. i. p. 81; Blackb., Trans. Roy. Soc. S.A. xiv. 1891, p. 68.
Mountains of Victoria.

3. FOSSUM, Blackb., P.L.S.N.S.W. (2) iii. 1888, p. 839.
S. Australia.

Family STAPHYLINIDÆ.

Sub-Family ALEOCHARIDES.

FALAGRIA, Mannerheim.

Sp. 1160. F. FAUVELI, Solsky = *Myrmecocephalus cingulatus*, Macl.; Oll., P.L.S.N.S.W. (2) i. 1886, p. 410.
Queensland; Gayndah.

Armitagei, Woll., Ins. Mad. 1854, p. 599.

dubia, Fvl., Ann. Soc. Ent. Fr. (4) iii. 1863, p. 429
P.L.S.N.S.W. (2) i. 1886, p. 464.
Australia ; widely distributed.

7656. VICINA, Oll., l.c. p. 464.
W. Australia ; K. G. Sound.

CORREA, Fauvel.

Sp. 1170. C. OXYTELINA, Fvl.; Oll., l.c. (2) i. 1886
S. Aust.; Adelaide.

POLYLOBUS, Solier.

7657. ACCEPTUS, Oll., P.L.S.N.S.W. (2) i. 1886, p. 441.
N.S. Wales; Watson's Bay, Sydney, &c.

7658. FUNGICOLA, Oll., l.c. p. 442.
N.S. Wales; Sydney.

7659. LONGULUS, Oll., l.c. p. 440.
N.S. Wales; Shelley's Flats.

7660. NOTUS, Oll., l.c. p. 440.
N.S. Wales; Sydney.

Sp. 1172. *P. aterrimus*, Fvl.; Oll., P.L.S.N.S.W. (2) i. 445.
W. Aust.; K. G. Sound.

Sp. 1173. P. CINCTUS, Fvl.; Oll., l.c. p. 436.
Victoria.

Sp. 1174. P. FLAVICOLLIS, Macl.; Oll., l.c. p. 438.
Queensland; Gayndah.

Sp. 1175. P. INSECATUS, Fvl.; Oll., l.c. p. 439.
N.S. Wales; Queensland.

Sp. 1176. P. PALLIDIPENNIS, Macl.; Oll., l.c. p. 437.
Queensland; Gayndah. N.S. Wales.

Sp. 1177. P. PARVICORNIS, Fvl.; Oll., l.c. p. 444.
Victoria.

MYRMEDONIA, Erichson.

Sp. 1179. M. CLAVIGERA, Fvl.; Oll., l c. (2) i. 1886, p. 448.
N.S. Wales; Sydney, &c.

Sp. 1180. M. INSIGNICORNIS, Fvl.; Oll., l.c. p. 448.
Australia.

BARRONICA, Blackburn.

5. SCORPIO, Blackb, Trans. Roy. Soc. S.A. xix. 1895, p. 203.
N. Queensland; Barron River District.

PELIOPTERA, Kraatz.

6. ASTUTA, Oll., P.L.S.N.S.W. (2) i. 1886, p. 424.
Tasmania.

Sp. 1181. P. SPECULARIS, Fvl.; Oll., l.c. p. 424.
N.S. Wales; Sydney.

CALODERA, Mannerheim.

7 AGLAOPHANES, Oll., l.c. (2) i. 1886, p. 430.
S. Aust.; Port Lincoln.

7668. ATYPHA, Oll., P.L.S.N.S.W. (2) i. 1886, p. 433.
Tasmania.

7669. CARISSIMA, Oll., l.c. p. 426.
Tasmania.

7670. ERITIMA, Oll., l.c. p. 429.
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7671. PACHIA, Oll., l.c. p. 432.
Tasmania.

7672. PYRRHA, Oll., l.c. p. 429.
N.S. Wales; Upper Hunter

7673. SIMSONI, Oll., l.c. p. 432.
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APPHIANA, Olliff.

7674. VERIS, Oll., P.L.S.N.S.W. (2) i. 1886, p. 422, t. 7. f. 1.
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GNYPETA, Thomson.

Sp. 1190. G. FULGIDA, Fvl.; Oll., l.c. (2) i. 1886, p. 421
Victoria.

OXYPODA, Mannerheim.

Sp. 1193. O. VARIEGATA, Fvl.; Oll., l.c. (2) i. 1886, p. 435.
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HOMALOTA, Mannerheim.

7675. ATYPHELLA, Oll., l.c. (2) i. 1886, p. 416.
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7676. CHARIESSA, Oll., l.c. p. 418.
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7677. CORIARIA, Kraatz, Ins. Deutsch. ii. p. 282; Sharp, Trans. Ent. Soc. Lond. 1869, p. 204; Fvl., Ann. Mus. Genov. x. 1877, p. 283.
australis, Jekel, Col. Jek. i. 1873, p. 47; Oll., l.c. p. 415.
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7678. INDEFESSA, Oll., l.c. p. 420.
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7679. MOLESTA, Oll., l.c. p. 415.
N.S. Wales; Sydney.

7680. PAVENS, Erichs., Käf. Mark. i. p. 689; Sharp, Trans. Ent. Soc. Lond. 1869, p. 98; Fvl., Ann Mus. Genov. xiii. 1878, p. 578; Oll., l.c. p. 469.
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Sp. 1209. B. SUTURALIS, Fvl.; Oll., l.c. p. 469.
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685. INTERMEDIA, Erichs., Käf. Mark. i. 1857, p. 383; Matthews, Cist. Ent. iii. 1883, p. 37 bis; Oll., l.c. (2) i. 1886, p. 472.
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DINOPSIS, Matthews.

Sp. 1210. D. AUSTRALIS, Fvl.; Oll., P.L.S.N.S.W. (2) i. 1886, p. 472.
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Sp. 1211. L. SIDNEENSE, Fvl.; Oll., l.c. (2) i. 1886, p. 903.
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CILEA, Jacquelin-Duval.

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Queensland; Ipswich. N.S. Wales; Tarcutta.

Sp. 1213. C. DISCIPENNIS, Fvl.; Oll., l.c. p. 901.
N.S. Wales; Sydney.

TACHINUS, Gravenhorst.

7687. MARGINELLUS, Fabr., Spec. Ins. i. p. 337; Erich. Staph. 1840, p. 263; Kraatz, Nat. Ins. p. 412; (2) i. 1886, p. 902.
N.S. Wales; Sydney.

7688. NOVITIUS, Blackb., Trans. Roy. Soc. S.A. xiv. 1891
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TACHYPORUS, Gravenhorst.

7689. VIGILANS, Oll., l.c. (2) i. 1886, p. 899.
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Sp. 1216. T. TRISTIS, Macl.; Oll., l.c. p. 899.
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)4. EXIMIUM, Oll., P.L.S N.S.W. (2) i. 1886, p. 896.
Victoria; S. Australia.

5. INSTABILIS (CONURUS), Blackb., Trans. Roy. Soc. S.A. x. 1887, p. 3.
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6. PHOXUM, Oll., l.c. (2) i. 1886, p. 894.
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Sp. 1212. C. ATRICEPS (CONURUS), Macl.; Oll., l.c. p. 895.
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Sp. 1219. C. ELONGATULUM (CONURUS), Macl.; Oll., l.c. p. 893.
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Sp. 1221. C. AUSTRALE (CONURUS), Erichs., Gen. Staph. 1840, p. 221; Fvl., Ann. Mus. Civ. Genov. x. 1877, p. 479; Oll., l.c. p. 890.
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N.S. Wales.

Sp. 1215. C. RUFIPALPE (CONURUS), Macl., = Sp. 1226. *C. stigmalis*, Fvl.; Oll., l.c. p. 891.
Australia; widely distributed.

Sp. 1227. C. TRIANGULUM, Fvl.; Oll., l.c. p. 892.
Victoria. S. and W. Australia.

TACHYNODERUS, Motschulsky.

Sp. 1218. T. AUSTRALIS, Fvl.; Oll., P.L.S.N.S.W. (2) i.
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Queensland; Cairns, Rockhampton, Wide Bay.

Sp. 1220. T. HÆMORRHOUS, Fvl.; Oll., l.c. p. 888.

North Aust. N.S. Wales. Tasmania.

BOLITOBIUS, Stephens.

7697. FAUVELI, Oll., l.c. (2) i. 1886, p. 905.

N.S. Wales; Sydney.

7698. SHARPI, Oll., l.c. p. 906.

N.S. Wales; Sydney.

Sub-Family STAPHYLINIDES.

ACYLOPHORUS, Nordmann.

7699. INDIGNUS, Blackb., Trans. Roy. Soc. S.A. x. 1887, p. 4

S. Aust.; Adelaide.

QUEDIUS, Stephens.

7700. ANDERSONI, Blackb., l.c. x. 1886-7, p. 6.

S. Aust.; Port Lincoln District

5. INCONSPICUUS, Blackb., Trans Roy. Soc. S.A. x. 1886-7, p. 5.
S. Aust.; Wallaroo.

6. KOEBELEI, Blackb., l.c. xix. 1895, p. 203.
N. Queensland.

7. MESOMELINUS, Marsh.; Fvl., Ann. Mus. Civ. Genov. xiii. 1878, p. 552.
Australia.

3. RUFICOLLIS (PHILONTHUS), Grav., Mon. p. 71; Erichs., Gen. Staph. p. 431; Kraatz, Berl. Zeit. 1859, p. 14, nota.
N.S. Wales. Victoria. S. Australia.

). TAURUS (HETEROTHOPS), Blackb., l.c. x. 1886-7, p. 4; l.c. xiv. 1891, p. 69.
S. Aust.; Port Lincoln.

). TEPPERI, Blackb., l.c. x. 1886-7, p. 6.
S. Aust.; Mount Lofty.

Sp. 1242. Q. CUPRINUS, Fvl. (var. [?] *baldiensis*); Blackb., l.c. xiv. 1891, p. 69.
Mountains of Victoria.

MYSOLIUS, Fauvel.

.. CHALCOPTERUS, Oll., P.L.S.N.S.W. (2) ii. 1887, p. 497.
N. Queensland; Mulgrave River.

ACTINUS, Fauvel.

2. MACLEAYI, Oll., l.c. (2) ii. 1887, p. 495.
N. Queensland; Cairns.

OXYPORUS, Fabricius.

3. RUFUS, Linn., Faun. Suec. nr. 844; Blackb., Trans. Roy. Soc. S.A. x. 1886-7, p. 6.
Australia.

COLONIA, Olliff.

7714. REGALIS, Oll., P.L.S.N.S.W. (2) ii. 1887, p. 494.
N.S. Wales; Richmond River.

CREOPHILUS, Mannerheim.

Sp. 1262. C. ERYTHROCEPHALUS, Fabr.; Oll., l.c (2) p. 492.
Norfolk and Lord Howe Islands.

Sp. 1263. C. LANIO, Erichs.; Oll., l.c. p. 492.

PHILONTHUS, Curtis.

7715. ÆNEUS, Rossi, Faun. Etr. i. p. 249.
Australia.

7716. DISCOIDEUS, Grav., Micr. p. 38.
Australia.

7717. HEPATICUS, Erichs., Gen. p. 451.
Australia.

7718. LONGICORNIS, Steph., Ill. Brit. v. p. 237.
Australia.

7719. NIGRITULUS, Grav., Micr. p. 41.

CAFIUS, Stephens.

3. AMBLYTERUS, Oll., P.L.S.N.S.W. (2) ii. 1887, p. 502.
Tasmania.

4. AUSTRALIS (OCYPUS), Redt., Reise Novara, Zool. ii. 1867, p. 28; Fvl., l.c. x. 1877, p. 251; Oll., l.c. p. 500.
N.S. Wales; Sydney.

5. DENSIVENTRIS, Fvl., l.c. p. 258; Oll., l.c. p. 507.
Queensland; Port Mackay.

6. LÆTABILIS, Oll., l.c. p. 501.
S. Aust. Tasmania.

7. LAEUS, Oll., l.c. p. 503.
N.S. Wales. S. Aust. Tasmania.

8. SERICEUS (REMUS), Holme, Trans. Ent. Soc. Lond. ii. 1837, p. 64; *Philonthus sericeus*, Erichs., Gen. Staph. 1840, p. 509; Fvl., l.c. xiii. 1878, p. 542; Oll., l.c. p. 507.
S. and W. Australia.

9. OCCIDENTALIS, Blackb., Trans. Roy. Soc. S.A. x. 1877, p. 48; Oll., l.c. p. 508.
W. Australia.

Sp. 1276. C. VELUTINUS, Fvl.; Oll., l.c. p. 506.
N.S. Wales. Victoria. W. Aust.

HESPERUS, Fauvel.

0. PACIFICUS, Oll., P.L.S.N.S.W. (2) ii. 1887, p. 509.
Lord Howe Island.

1. PULLEINEI, Blackb., l.c. x. 1887, p. 7; Oll., l.c. p. 512.
S. Aust.; Burnside.

Sp. 1278. H. HÆMORRHOIDALIS, Macl. = Sp. 1179, *H. mirabilis*, Fvl.; Oll., l.c. p. 508.
N.S. Wales. Queensland.

Queensland. N.S. Wales.

XANTHOLINUS, Serville.

7732. ALBERTISI, Fvl., Ann. Mus. Civ. Genov. :
l.c. xii. 1878, p. 245, t. i. f. 26; Oll.,
p. 489.
Northern Queensland.

7733. CYANOPTERUS, Erichs., Gen. Staph. 1840,
p. 488.
Tasmania. Victoria.

7734. HOLOMELAS, Perr., Ann. Soc. Linn. Lyon,
Fvl., Ann. Soc. Ent. Fr. 1874, p. 436;
Genov. x. 1877, p. 244: Oll., l.c. p. 488
Australia; widely distributed.

7735. LORQUINI, Fvl., Ann. Mus. Civ. Genov.
l.c. xii. 1878, p. 245, t. 1, f. 25; Oll., l.c
N.S. Wales. Queensland.

7736. OLLIFFI, Lea, P.L.S.N.S.W. (2) ix. 1895,]
N.S. Wales; Tamworth.

7737. ORTHODOXUS, Oll., l.c. (2) ii. 1887, p. 484.
N.S. Wales; Sydney, Port Hacking.

Sp. 1285. X. CHALCOPTERUS, Erichs. = Sp.
...cennis Macl.; Oll., l.c. p. 486.

Sp. 1288. X. CRIBRATUS, Fvl.; Oll., P.L.S.N.S.W. (2) ii. 1887, p. 490.

Victoria.

Sp. 1291. X. ERYTHROPTERUS, Erichs., Gen. Staph. 1840, p. 320; Fvl., Ann. Mus. Civ. Genov. x. 1877, p. 240; Oll., l.c. p. 480.

Australia; widely distributed.

Sp. 1292. X. HÆMORRHOUS, Fvl.; Oll., l.c. p. 480.

Queensland; Rockhampton.

Sp. 1293. X. PHŒNICOPTERUS, Erichs., Gen. Staph. 1840, p. 314; Oll., l.c. p. 483.

Australia; widely distributed.

Sp. 1294. X. RUFITARSIS, Fvl.; Oll., l.c. p 481.

N.S. Wales. Queensland.

Sp. 1295. X. SIDERALIS, Fvl.; Oll., l.c. p. 486.

W. Australia.

Sp. 1296. X. SOCIUS, Fvl. = *Leptacinus picticornis*, Blackb., Trans. Roy. Soc. S.A. x. 1887, p. 7; l.c. p. 190: Oll., P.L.S.N.S.W. (2) ii. 1887, p. 476; l.c. p. 490.

Australia; widely distributed.

LEPTACINUS, Erichson.

3. FILUM, Blackb., Trans Roy. Soc. S.A. x. 1887, p. 7; Oll., P.L.S.N.S.W. (2) ii. 1887, p. 477.

S. Aust.; Port Lincoln.

9. LINEARIS, Grav., Micr. p. 43; Blackb, l.c. p. 7; Oll., l.c. p. 476.

S. Aust.; Port Lincoln.

0. PARUMPUNCTATUS, Gyll., Ins. Suec. iv. 1808, p. 481; Erichs., Gen. Staph. 1840, p. 335; Fvl., Ann. Mus. Civ. Genov. xiii. 1878, p. 537; Oll., l.c. p. 474.

Victoria.

Queensland ; Cayman.

METOPONCUS, Kraatz.

7741. CAIRNSENSIS, Blackb., Trans. Roy. Soc. S.A
204.
N. Queensland.

7742. ENERVUS, Oll., l.c. (2) ii. 1877, p. 478.
Tasmania.

7743. FUGITIVUS, Oll., Mem. Aust. Mus. ii. 1889,
Lord Howe Island.

Sp. 1298. M. CYANEIPENNIS, Macl.; Oll., P
ii. 1887, p. 477.
N.S. Wales. Queensland. Lord Ho

DIOCHUS, Erichson.

Sp. 1301. D. DIVISUS, Fvl.; Oll., l.c. (2) ii.
N.S. Wales.

Sp. 1302. D. OCTAVII, Fvl.; Oll., l.c. p. 47
Queensland ; Wide Bay. Victoria.

Sub-Family PÆDERIDES.

LATHROBIUM, Gravenhorst.

7744. ADELAIDÆ, Blackb., Trans. Roy. Soc. S.A.

Sp. 1304. L. AUSTRALICUM, Solsky = Sp. 1374. *Notobium australicum*, Solsky; Fvl., Ann. Mus. Civ. Genov. x. 1877, p. 227.

HYPEROMA, Fauvel.

7747. ABNORME, Blackb., Trans. R. Soc. S.A. xv. 1892, p. 22.
Victoria; Alpine District.

S. 1317. H. LACERTINUM, Fvl.; Blackb., l.c. xiv. 1891, p. 71; l.c. xv. 1892, p. 21.
Victorian Alps.

SCYMBALIUM, Erichson.

7748. AGRESTE, Blackb., l.c. x. 1887, p. 8.
S. Aust.; Port Lincoln, &c.

7749. LÆTUM, Blackb., l.c. p. 9.
S. Aust.; Henley Beach and Woodside.

DICAX, Fauvel.

Sp. 1335. D. LONGICEPS, Fvl. = Sp. 1310. *Lathrobium longiceps*, Fvl.

CRYPTOBIUM, Mannerheim.

7750. ADELAIDÆ, Blackb., Trans. Roy. Soc. S A. x. 1887, p. 69.
S. Aust.; Adelaide.

7751. DELICATULUM, Blackb., l.c. p. 69.
S. Aust.; Port Lincoln.

7752. ELEGANS, Blackb., l.c. p. 70.
S. Aust.; Port Lincoln.

7753. VARICORNE, Blackb., l.c. p. 68.
S. Aust.; Port Lincoln.

STILICUS, Latreille.

Sp. 1341. S. OVICOLLIS, Macl., = *Scopæus ruficollis*, Fvl.; Blackb., l.c. xviii. 1894, p. 203.

SCOPÆUS, Erichson.

7754. DUBIUS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p.
Victorian Alps.

7755. FEMORALIS, Blackb., l.c. xv. 1892, p. 22.
N.S. Wales, Blue Mountains.

7756. LATEBRICOLA, Blackb., l.c. x. 1887, p. 71.
S. Australia.

7757. OBSCURIPENNIS, Blackb., l.c. xiv. 1891, p. 73.
Victoria; Wandiligong.

LITHOCHARIS, Lacordaire.

7758. CINCTA, Fvl., Ann. Mus. Civ. Genov. x. 1877, p.
Australia.

7759. DEBILICORNIS, Woll., Cat. Col. Mader. 1857, p.
l.c. 1878, p. 215.
Australia.

7760. LINDI, Blackb., l.c. x. 1886-7, p. 48.
S. Aust.; Port Lincoln.

7661. OBSOLETA, Nordm., Symbol. p. 146; Fvl., l.c. x. 187

5. MEYRICKI, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 72.
W. Australia.

3. SIMSONI, Blackb., P.L.S.N.S.W. (2) ix. 1894, p. 91.
Tasmania.

Sp. 1355. P. CRUENTICOLLIS, Germ.; Blackb., Trans. Roy. Soc. S.A. xiv. 1891, p. 72 = Sp. 1354, *P. cingulatus*, Macl.; Fvl., Ann. Mus. Civ. Genov. x. 1877, p. 223.

SUNIUS, Stephens.

. ÆQUALIS, Blackb., Trans. Roy. Soc. S.A. x. 1887, p. 9.
S. Aust.; Port Lincoln.

PALAMINUS, Erichson.

. NOVÆ-GUINEÆ, Fvl.; Blackb., l.c. xix. 1895, p. 204.
N. Queensland; Barron River.

). VITIENSIS, Fvl.; Blackb., l.c. p. 204.
N. Queensland.

Sp. 1358. P. AUSTRALIÆ, Fvl.; Blackb., l.c. xiv. 1891, p. 75.
Queensland.

ŒDICHIRUS, Erichson.

). ANDERSONI, Blackb., l.c. x. 1887, p. 10.
S. Aust.; Port Lincoln.

PINOPHILUS, Gravenhorst.

1. LATEBRICOLA, Blackb., l.c. x. 1887, p. 10.
S. Aust.; Henley Beach.

P. AUSTRALIS, Har., = Sp. 1370. *P. opacus*, Redt.; Fvl., Ann. Mus. Civ. Genov. x. 1877, p. 213. (nom. præocc.)

Sub-Family STENIDES.

2. AUSTRALICUS, Blackb., P.L.S.N.S.W. (2) v. 1891, p. 780.
Mountains of Victoria.

Sub-Family OXYTELIDES.

BLEDIUS, Stephens.

7773. ADELAIDÆ, Blackb., Trans. Roy. Soc. S.A. x. 18
S. Aust.; Adelaide.

7774. CAROLI, Blackb., l.c. p. 13.
S. Aust.; Port River.

7775. INFANS, Blackb., l c. xiv. 1891, p. 76.
Victoria; Ovens River.

7776. INJUCUNDUS, Blackb., l.c. x 1887, p. 14.
S. Aust ; Port Lincoln.

7777. INSIGNICORNIS, Blackb., l.c. xiv. 1891, p. 75.
Victoria ; Ovens River.

7778. MINAX, Blackb., l.c. x. 1887, p. 14.
S. Aust.; Port Lincoln.

7779. OVENSENSIS, Blackb., l c. xiv. 1891, p. 76.
Victoria ; Ovens River.

TROGOPHLŒUS, Mannerheim.

7780 BILINEATUS, Steph , Ill Brit. v. p 324, t. 27, f

OXYTELUS, Gravenhorst.

:. SCULPTUS, Grav., Mon. p. 191; Fvl., Ann. Mus. Civ. Genov. x. 1877, p. 200.
Australia.

Sub-Family OMALIDES.

AMPHICHROUM, Kraatz.

5. ADELAIDÆ, Blackb., Trans. Roy. Soc. S.A. xv. 1892, p. 23.
S. Aust.; near Adelaide.

OMALIUM, Gravenhorst.

6. ADELAIDÆ, Blackb., l.c. x. 1887, p. 191.
S. Aust.; Torrens River.

Sub-Family PIESTIDES.

ELEUSIS, Castelnau.

7. PARVA, Blackb., l.c. xv. 1892, p. 24.
N.S. Wales; Blue Mountains.

LEPTOCHIRUS, Germar.

8. SAMOENSIS, Blanch., Voy. Pôle Sud, p. 54, t. 4, f. 11; Fvl., l.c. xiii. 1878, p. 480.
N. Queensland.

Family PSELAPHIDÆ.

Sub-Family PSELAPHIDES.

CTENISTES, Reichenbach.

9. ADELAIDÆ, Blackb., Trans. R. Soc. S. A. xii. 1889, p. 136.
S. Aust.; Adelaide.

0. ANDERSONI, Blackb., l.c. xiv. 1891, p. 77.
S. Australia.

7791. TENEBRICOSUS, Blackb., Trans. R. Soc. S. A. xii. p. 137.

S. Aust ; Port Lincoln.

Sp. 1438. C. KREUSLERI, King; Blackb., l.c. p. 137

TYROMORPHUS, Raffray.

7792. COMES, Schauf., Tijdschr. Ent. xxix. 1886, p. 284.

Australia.

7793. CONSTRICTINASUS, Schauf., l.c. p. 285.

Australia.

EUDRANES, Sharp.

7794. CARINATUS, Sharp, Ent. Mo. Mag. xxviii. 1892, p.

N. W. Australia.

DIDIMOPRORA, Raffray.

Sp. 1455. TYRUS VICTORIÆ, King; Raff., Rev. d'
1890, p. 148.

TYRAPHUS, Sharp.

7795. PROPORTIONALIS, Schauf., Tijdschr. Ent. xxix. 1886

Australia.

7796. SOBRINUS, Schauf., l.c. p. 262

GONATOCERUS.

1. TERTIUS, Schauf., Tijdschr. Ent. xxix. 1886, p. 279.
Australia.

PSELAPHUS, Aubé.

2. BIPUNCTATUS, Schauf., Tijdschr. Ent. xxix. 1886, p. 250.
Australia.

3. FRONTALIS, Schauf., l.c. p. 251.
Australia.

4. INSIGNIS, Schauf., l.c. p. 249.
Australia.

5. LONGEPILOSUS, Schauf., l.c. p. 248.
Australia.

6. SQUAMICEPS, Schauf., l.c. p. 252.
Australia.

7. TRIPUNCTATUS, Schauf., l.c. p. 252.
Australia.

TOSIMUS, Schaufuss.

8. GLOBULICORNIS, Schauf., Tijdschr. Ent. xxix. 1886, p. 295.
Australia.

9. LONGIPES, Schauf., l.c. p. 294.
Australia.

0. MODESTUS, Schauf., l.c. p. 295.
Australia.

Spp. 1477 + 1478 to be placed in this genus.

TYCHUS, Leach.

1. POLITUS, Schauf., Tijdschr. Ent. xxix. 1886, p. 260.
Australia.

7812. TASMANIÆ, Schauf., Tijdschr. Ent. xxix. 1886, p.
Tasmania.

CURCULIONELLUS.

7813. ANOPUNCTATUS, Schauf., Tijdschr. Ent. xxix. 18
Australia.

7814. BICOLOR, Schauf., l.c. p. 253.
Australia.

7815. SEMIPOLITUS, Schauf., l.c. p. 255.
Australia.

DURBOS.

7816. AFFINIS, Schauf., Tijdschr. Ent. xxix. 1886, p.
Australia.

7817. CRIBRATIPENNIS, Schauf., l.c. p. 292.
Australia.

7818. INTERMEDIUS, Schauf., l.c. p. 292.
Australia.

7819. INTERRUPTUS, Schauf., l.c. p. 291.
Australia.

MESOPLATUS, Raffray.

OVENSENSIS, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 80.
Victoria; Ovens River.

PALUDIS, Blackb., l.c. p. 81.
S. Aust.; near Adelaide.

Sp. 1825. B. HYALINA, Schauf.; Blackb., l.c. p. 79.

EUPINES, King.

MILITARIS, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 85.
S. Aust.; near Port Lincoln.

NAUTA, Blackb., l.c. p. 83.
S. Aust.; near Port Lincoln.

NAUTOIDES, Blackb., l.c. p. 84.
S. Aust.; near Port Lincoln.

RELICTA, Blackb., l.c. p. 292.
Victoria; Mordialloc.

SORORCULA, Blackb., l.c. p. 82.
Australian Alps.

SPINIVENTRIS, Blackb., l.c. p. 84.
S. Aust.; near Port Lincoln.

CYATHIGER, King.

REITTERI, Schauf., Tijdschr. Ent. xxix. 1886, p. 242.
Australia.

ABASCANTUS, Schaufuss.

SANNIO, Schauf., Tijdschr. Ent. xxix. 1886, p. 258.
Australia.

ARTICERUS, Dalman.

ASPER, Blackb., Trans. R. Soc. S. A. xii. 1889, p. 138.
S. Aust.; Adelaide.

7834. FOVEICOLLIS, Raffr., Rev. d'Ent. vi. p. 18.
Australia.

EDÆRANES, Reitter.

Wien. Ent. Zeit. iv. p. 228, for *Narcodes* (nom. pr

Family PAUSSIDÆ.

PAUSSUS, Linné.

7835. AUSTRALIS, Blackb., Trans. R. Soc. S. A. xiv. 1891, p
Queensland; Mt. Bartle Frere.

ARTHROPTERUS, W. S. Macleay

7836. FOVEIPENNIS, Blackb., Trans. R. Soc. S. A. xv. 1892,
S. Aust.; N. Territory near Palmerston.

7837. KINGI, Macl., Trans. Ent. Soc. N. S. W. ii. 1871, p
Queensland, Gayndah.

7838. OCCIDENTALIS, Blackb., Trans. R. Soc. S. A. xv. 1892,
W. Aust.; Yilgarn.

Sp. 1591. A. DENUDATUS, Westw., = Sp. 1584. *A. an*
co ns Macl., Gestro. Ann. Mus. Civ. Genov. 1884

COLON, Herbst.

0. MELBOURNENSE, Blackb., Trans. R. Soc. S. A. xv. 1892, p. 25.
Victoria; near Melbourne.

CHOLEVA, Latreille.

1. ADELAIDÆ, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 87.
S. Australia.

2. ANTIPODUM, Blackb., l.c. p. 87; l.c. xviii. 1894, p. 139.
Victorian Alps. Tasmania.

3. MINUSCULA, Blackb., l.c. p. 88.
S. Australia.

4. VICTORIENSIS, Blackb., l.c. p. 88.
Victorian Alps.

Sp. 1648. C. AUSTRALIS, Erichs.; Blackb., l.c. p. 67

CHOLEVOMORPHA, Blackburn.

5. PICTA, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 90
Mountains of Victoria.

Family SCAPHIDIDÆ.

SCAPHIDIUM, Olivier.

6. ALPICOLA, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 90.
Victorian Alps.

SCAPHISOMA, Leach.

7. NOVICUM, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 91.
Victorian Alps.

Family HISTERIDÆ.

Sub-Family HOLOLEPTIDES.

HOLOLEPTA, Paykull.

Sp. 1667. H. SIDNENSIS, Mars., = Sp. 1666. *H. Mastersi*, Macl.; Lewis, Ann. Nat. Hist. (6) xi. 1893, p. 418.

PLATYSOMA, Leach.

7848. BIIMPRESSUM, Schmidt, Ent. Nachr. xviii. 1892, p. 2
Queensland.

7849. CONDITUM, Mars., Ann. Mus. Civ. Genov. 1879, p.
Australia.

7850. CONSTRICTUM, Lewis, Ann. Nat. Hist. (6) vii. 1891
N. W. Australia.

7851. MOLUCCANUM, Mars., Ann. Mus. Civ. Genov. 1879
Australia.

7852. PAUGAMI, Mars., l.c. p. 266.
Australia.

7853. ROBUSTUM, Schmidt, Ent. Nachr. xviii. 1892, p. 2
Australia.

7854. SEMILINEATUM, Schmidt, l c. p. 22.
Australia.

Sub-Family HISTERIDES.

CARCINOPS, Marseul.

7855. PUMILIO, Erichs., Jahrb. 1834, p. 110. Mars., M

CHLAMYDOPSIS, Marseul?

58. INÆQUALIS, Blackb., Trans. R. Soc. S. A. xiv. 1891, p 94.
S. Aust.; near Woodville.

59. STERNALIS, Blackb., l.c. p. 93.
S. Aust.; near Woodville.

Sp. 1695. C. STRIATELLA, Westw. = Sp. 1914. *Byzenia formicicola*, King; Lewis, Ann. Nat. Hist. (6) xiv. 1894, p. 113.

TERETRIOSOMA, Marseul?

0. SOMERSETI, Mars., Ann. Mus. Civ. Genov. 1879, p. 281.
N. Queensland; Somerset.

TERETRIUS, Erichson.

1. AUSTRALIS, Lewis, Ann. Nat. Hist. (6) xi. 1893, p. 428.
Queensland.

2. BASALIS, Lewis, l.c. (6) iii. 1889, p. 286.
S. Australia. ?

3 WALKERI, Lewis, l.c. ix. 1892, p. 353.
Tasmania.

SAPRINODES, Lewis.

4. FALCIFER, Lewis, Ann. Nat. Hist. (6) viii. 1891, p. 396.
Queensland; Rockhampton.

SAPRINUS, Erichson.

5. SPECIOSUS, Erichs., Jahrb. 1834, p. 179; Mars., Mon. 1855, t. 16, f. 23; Ann. Mus. Civ. Genov. 1879, p. 280.
Australia.

ACRITUS, Leconte.

6. TASMANIÆ, Lewis, Ann. Nat. Hist. (6) ix. 1892, p. 357.
Tasmania.

Family PHALACRIDÆ.

LITOCHRUS, Erichson.

7867. ALPICOLA, Blackb., Trans. R. Soc. S.A. xiv. 1891, p
Victorian Alps.

7868. ALTERNANS, Blackb., l.c. p. 95.
Victorian Alps.

7869. COLORATUS, Blackb., l.c. xix. 1895, p. 207.
N. Queensland; near Cairns.

7870. CONSORS, Blackb., l.c. xvii. 1893, p. 295.
N. Queensland; near Cairns.

7871. FRIGIDUS, Blackb., l.c. xiv. 1891, p. 97.
Victorian Alps.

7872. KOEBELEI, Blackb., l.c. xix. 1895, p. 208.
N. S. Wales; Blue Mountains.

7873. LÆTICULUS, Blackb., l.c. xiv. 1891, p. 95.
Victorian Alps.

7874. LATERALIS, Blackb., l.c. p. 97.
S. Aust.; near Port Lincoln

7880. SUTURELLUS, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 96.
W. Australia.

7881. SYDNEYENSIS, Blackb., l.c. xv. 1892, p. 26.
N.S. Wales; near Sydney.

7882. TINCTUS, Blackb., l.c. xix. 1895, p. 208.
N. Queensland; near Cairns.

7883. UNIFORMIS, Blackb., l.c. xiv. 1891, p. 98.
S. Aust.; near Adelaide.

PARASEMUS, Guillebeau.

7884. COMES, Blackb., Trans. R. Soc. S.A. xix. 1895, p. 212.
N. Queensland; near Cairns.

7885. DISCOIDEUS, Blackb., l.c. p. 211.
N. Queensland; near Cairns.

7886. DOCTUS, Blackb., l.c. p. 212.
N. S. Wales; Blue Mountains.

7887. GROUVELLI, Guill., Ann. Soc. Ent. Fr. 1894, p. 300.
Australia.

7888. INTERNATUS, Blackb., Trans. Roy. Soc. S. A. xix. 1895, p. 213.
S. Aust.; Petersburg.

7889. MODESTUS, Blackb., l.c. p. 212.
N. Queensland; near Cairns.

7890. OBSOLETUS, Blackb., l.c. p. 213.
N. Queensland; near Cairns.

7891. TORRIDUS, Blackb., l.c. p. 211.
N. Queensland; near Cairns.

PHALACRINUS, Blackburn.

7892. AUSTRALIS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 99.
S. Aust.; Port Lincoln, &c.

N. Queensland; near Cairns.

7895. OBTUSUS, Blackb., l.c. xiv. 1891, p. 10(
S. Aust.; Port Lincoln.

7896. ROTUNDUS, Blackb., l.c. p. 100.
S. Aust.; near Port Lincoln.

PHALACRUS, Paykull.

7897. BURRUNDIENSIS, Blackb., Trans. R. S
p. 101.
N. Territory of S. Aust.

7898. CORRUSCANS, Payk., Faun. Suec. iii. 17
l.c. p. 100.
S. Australia. Victoria.

MICROMERUS, Guillebeau

7899. AMABILIS, Guill., Ann. Soc. Ent. Fr. 1
Australia.

OLIBRUS, Erichson.

7900. VICTORIENSIS, Blackb., Trans. R. Soc. S
Victorian Alps, and N.S. Wales.

Family NITIDULID

903. DIMIDIATUS, Fabr., Ent. Syst. i. p. 261; Murray, Mon. 1864, p. 379.
Australia.

CIRCOPES, Motschulsky.

Sp. 1762. C. (POCADIUS) PILISTRIATUS, Macl.; Reit. Verh. Ver. Brünn, xii. 1873, p. 80.

MIMEMODES, Fairmaire ?

4. LATICEPS (PROSTOMIS), Macl., Trans. Ent. Soc. N.S W. ii. 1871, p. 167; Fairm., Ann. Soc. Ent. Fr. (6) i. 1881, p. 257; Reit., Wien. Ent. Z. iii. p. 272.
Queensland; Gayndah, Wide Bay, &c.

NOTOBRACHYPTERUS, Blackburn.

5. AUSTRALIS, Blackb., Trans. R. Soc. S.A. xv. 1892, p. 27.
W. Australia.

6. BIFOVEATUS, Blackb., l.c. p. 28.
S. Aust.; near Adelaide.

7. CREBER, Blackb., l.c. p. 27.
S. Aust.; Port Lincoln District.

8. LILLIPUTANUS, Blackb., l.c. p. 29.
S. Australia.

9. NITIDIUSCULUS, Blackb., l.c. p. 28.
W. Australia.

BRACHYPEPLUS, Erichson.

Sp. 1722. Murrayi, Macl., = *B. Haagi*, Reit.; Blackb., Trans. R. Soc. S.A. xviii. 1894, p. 203.

IDÆTHINA, Reitter.

0. CINCTA, Blackb., Trans. R. Soc. S. A. xiv. 1891, p. 107.
S. Aust.; near Victor Harbour.

Queensland; Mt. Bellenden-Ker.

7912. DECEPTOR, Blackb., l.c. p. 108.

N. Territory of S. Australia.

Sp. 1735. CARPOPHILUS LURIDIPENNIS, Reit.; Blackb., l.c. xviii. 1894, p. 2(

ERICMODES, Reitter.

7913 AUSTRALIS, Grouv., Trans. R. Soc. S.A.

S. Australia.

NITIDULA, Fabricius.

7914. QUADRIPUSTULATA, Fab., Ent. Syst. Trans. R. Soc. S.A. xiv. 1891, p. 10

S. Aust.; Adelaide (probably intr

ÆTHINODES, Blackburn.

7915. MARMORATUM, Blackb., Trans. R. So p. 109.

Tropical Australia.

LASIODACTYLUS, Perty.

7916. CALVUS, Oll., P.L.S.N.S.W. (2) ii. 1887

Norfolk Island.

7918. NITIDA, Reit., MT. Münch. Ent. Ver. i. 1877, p. 129.
S. Aust.; Adelaide.

SORONIA, Erichson.

7919. SIMULANS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 105.
Victorian Alps.

THALYCRODES, Blackburn.

Sp. 1753. T. AUSTRALE (? Germ.), Blackb., l.c. xiv., 1891, p. 110.
S. Australia.

7920. CYLINDRICUM, Blackb., l.c. p. 112.
Victorian Alps.

7921. PULCHRUM, Blackb., l.c. p. 111.
S. Aust.; near Port Lincoln.

HAPTONCURA, Reitter.

7922. LINDENSIS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 103.
S. Aust.; near Port Lincoln.

7923. MEYRICKI, Blackb., l.c. p. 104.
W. Australia.

7924. UNIFORMIS, Blackb., l.c. p. 104.
Victorian Alps.

7925. VICTORIENSIS, Blackb., l.c. p. 103.
Victorian Alps. Tasmania.

OMOSITA, Erichson.

7926. COLON, Linn., Faun. Suec. p. 151; Erichs., Nat. Ins. iii. p. 167.
N.S. Wales (introduced).

1875, p. 74.

S. Australia.

LEPERINA, Erichson.

7928. CONSPICUA, Oll., P.L.S.N.S.W. x. 1886,
Lizard Island, N.E. Australia.

7929. FRATERNA, Oll., l.c. p. 707.
W. Aust.; Salt River.

7930. SEPOSITA, Oll., l.c. p. 702.
King George's Sound.

Sp. 1780. L. TURBATA, Pasc., = Sp. 1
Redtenb.; Oll., l.c. p. 705.

Sp. 1774. L. DECORATA, Erichs., =
ensis, Macl.; Oll., l.c. p. 702.

LATOLÆVA, Reitter.

7931. CASSIDIOIDES, Reitt., Verh. Ver. Brünn,
N. Queensland; Cape York, &c.

NEASPIS, Pascoe.

7932. PUSILLA, Blackb., Trans. R. Soc. S.A. xi
S. Aust.; near Adelaide.

Sp. 1752. N. (SORONIA) VARIEGATA,

PELTOSCHEMA, Reitter.

7934. FILICORNIS, Reitt., Verh. Ver. Brünn, xviii. 1880, p. 5.
Australia.

LOPHOCATERES, Olliff.

7935. IVANI, Allib., (OSTOMA), Rev. Zool. 1847, p. 12; Oll., P.L.S. N.S.W. x. 1885. p. 715.
Sydney.

ANCYRONA, Reitter.

7936. ÆGRA, Oll., P.L.S.N.S.W. x. 1885, p. 711.
Sydney.

7937. AMICA, Oll., l.c. p. 713.
W. Aust.; Albany. S. Aust.; Port Lincoln.

7938. LATEBROSA, Oll., l.c. p. 712.
Queensland; Wide Bay.

7939. LATICEPS, Oll., l.c. p. 710.
N.S. Wales and Queensland.

7940. VESCA, Oll., l.c. p. 713.
N.S. Wales: S. Aust.: W. Aust.

PELTONYXA, Reitter.

7941. AUSTRALIS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 113
S. Aust.; Adelaide District.

7942. PUBESCENS, Blackb., l.c. p. 113.
Victoria; Alpine District.

PHYCOSECIS, Pascoe.

Removed from *Tenebrionidæ* to *Trogositidæ;* Champ. Trans. Ent. Soc. Lond. 1894, p. 364.

7943. COSTATUS, Blackb., Trans. R. Soc. S.A. :
S. Australia.

7944. ELONGATUS, Blackb., l.c. p. 116.
S. Aust.; Port Lincoln District.

7945. PROXIMUS, Blackb., l.c. p. 116.
S. Aust.; near Adelaide.

7946. PUSTULOSUS, Blackb., l.c. p. 116.
S. Australia.

DITOMA, Herbst.

7947. HILARIS, Blackb., Trans. R. Soc. S.A. x.
S. Aust ; Port Lincoln, &c.

7948. LINEATOCOLLIS, Blackb., l.c. p. 195.
S. Aust.; Port Lincoln, &c.

7949. NIVICOLA, Blackb., l.c. xiv. 1891, p. 114.
Victorian Alps.

7950. OBSCURA, Blackb., l c. x. 1887, p. 193
S Aust ; Roseworthy.

7951. PARVA, Blackb., l.c. p. 193.
S. Aust.; Woodville.

MERYX, Latreille.

7955. ÆQUALIS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 115.
S. Aust.; near Port Lincoln.

SARROTRIUM, Illiger.

7956. AUSTRALE, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 115.
Victorian Alps.

PHORMESA, Pascoe.

7957. EPITHECA, Oll., Mem. Aust. Mus. ii. 1889, p. 83.
Lord Howe Island.

GEMPYLODES, Pascoe.

7958. TMETUS, Oll., Mem. Aust. Mus. ii. 1889. p. 83.
Lord Howe Island.

PYCNOMERUS, Erichson.

7959. LONGULUS, Sharp, Trans. R. Dubl. Soc. (2) iii. 1886, p. 389, t. 12, f. 21; Oll., Mem. Aust. Mus. ii. 1889, p. 84.
Queensland; Pine Mountain, near Ipswich.

7960. MŒSTUS, Oll., l.c. p. 83.
Lord Howe Island.

MINTHEA, Pascoe.

7961. SIMILATA (?), Pasc., Journ. of Ent. ii. 1863, p. 141, t. 8, f. 10; Blackb., Trans. R. Soc. S.A. xiii. 1890, p. 121.
Adelaide (probably introduced).

TRISTARIA, Reitter.

7962. FULVIPES, Reitt., Stett. Ent. Zeit. xxxix. 1878, p. 322.
Australia.

7962 *bis*. GROUVELLEI, Reitt., l.c. p. 321.
Queensland; Rockhampton.

7963. LABRALIS, Blackb., Trans. R. Soc. S.A. xv. 1892, p. 30.
Victoria; near Cheltenham.

7965. RUFULA, Grouv., l.c. p. 144.
W. Australia.

SYMPANOTUS.

7966. AUSTRALIS, Grouv., Trans. R. Soc. S.A. xv
Mountains of Victoria.

BOTHRIDERES, Erichson.

7967. COSTATUS, Blackb., Trans. R. Soc. S.A. x.
S. Aust.; Port Lincoln.

7968. TIBIALIS, Blackb., l.c. p. 196.
S. Aust.; Victoria.

7969. VARIABILIS, Blackb., l.c. p. 196.
S. Aust., Victoria.

7970. VICTORIENSIS, Blackb., l.c. xiv. 1891, p. 1
Victorian Alps.

Sp. 1815. B. MERUS, Pasc.; Blackb., l.c. p

Sp. 1806. B. (DERETAPHRUS) PUTEUS, New
of Ent. i. p. 240.

NEOTRICHUS, Sharp.

7971. LUCIFUGUS, Oll., Mem. Aust. Mus. ii. 188

Family CUCUJIDÆ.

Sub-Family CUCUJIDES.

LEMOPHLÆUS, Castelnau.

7973. AUSTRALASIÆ, Blackb., Trans. R. Soc. S.A. xv. 1892, p. 30.
Victoria; Dandenong Ranges.

7974. DIFFICILIS, Blackb., P.L.S.N.S.W. (2) iii. 1888, p. 840.
S. Aust.; Port Lincoln.

7975. LINDI, Blackb., l.c. p. 841.
S, Australia.

7976. PUSILLUS (CUCUJUS), Schön., Syn. Ins. i. 3, p. 55.
L. (CUCUJUS) *testaceus*, Steph., (*nec* Fab.) Ill. Brit. Ins. iv. p. 224, t. 21, f. 9; Blackb., Trans. R. Soc. S.A. xiii. 1890, p. 121.
Australia (probably introduced).

Sub-Family HEMIPEPLIDES.

INOPEPLUS, Smith.

7977. OLLIFFI, v. d. Poll, Notes Leyden Mus. 1887, p. 140.
N. Queensland.

Sub-Family TELEPHANIDES.

CRYPTAMORPHA, Wollaston.

7978. DELICATULA, Blackb., Trans. R. Soc. S.A. x. 1887, p. 200.
S. Aust.; Port Lincoln.

7979. LINDI, Blackb., l.c. p. 198.
S. Aust.; Port Lincoln.

7980. MACLEAYI, Blackb., l.c. xv. 1892, p. 31.
N.S. Wales; Blue Mountains.

S. Aust., Port Lincoln, &c.

7983. VICTORIÆ, Blackb., l.c. p. 199.
Western Victoria.

Sub-Family SILVANIDES.

SILVANUS, Latreille.

7984. ADVENA, Waltl., Faunus, i. 1832, p. 169; 1
R. Soc. S.A. x. 1887, p. 200.
Australia (introduced).

7985. ARMATULUS, Blackb., l.c. xiv. 1891, p. 118.
Victorian Alps.

7986. MONTICOLA, Blackb., l.c p. 118.
Victorian Alps.

7987. UNIDENTATUS, Oliv., Ent. ii. 18, p. 12, t. 1
l.c. 1887, p. 200.
S. Aust. and Victoria.

MYRABOLIA, Reitter.

7988. LINDENSIS, Blackb., Trans. R. Soc. S.A. xv.
S. Aust.; near Port Lincoln.

7989. PARVA, Blackb., l.c. p. 32.
N.S. Wales; near Sydney.

Sp. 1876. M. HAROLDIANA, Reitt.; Blackb.

. CAIRNSENSIS, Blackb., Trans. R. Soc. S.A. xix. 1895, p. 217.
N. Queensland; near Cairns.

. KOEBELEI, Blackb., l.c. p. 217.
Queensland.

. SHARPI, Blackb., l.c. p. 216.
N. Queensland; near Cairns.

. SINGULARIS, Blackb., l.c. p. 218.
N. Queensland.

STYGIUS, Blackb., l.c. p 218.
N. Queensland.

ATOMARIA, Stephens.

. AUSTRALIS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 119.
S. Australia.

. EUCALYPTI, Blackb., l.c. xv. 1892, p. 33.
N.S. Wales; Blue Mountains.

. LINDENSIS, Blackb., l.c. xiv. 1891, p. 119.
S. Aust.; near Port Lincoln.

CRYPTOPHAGUS, Herbst.

. AFFINIS, Sturm., Ins. xvi. p. 79, t. 314, f. c. C.; var. ? AUSTRALIS, Blackb., Trans. R. Soc. S.A. x. 1887, p. 201.
S. Australia (probably introduced).

GIBBIPENNIS, Blackb., l.c. xv. 1892, p. 32.
Victoria and Tasmania.

LINDENSIS, Blackb., l.c. xiv. 1891, p. 119.
S. Aust.; Port Lincoln District.

Family LATHRIDIIDÆ.

LATHRIDIUS, Herbst.

APICALIS, Blackb., Trans. R. Soc. S.A. x. 1887, p. 204.
S. Aust.; Port Lincoln.

8003. AUSTRALICUS, Belon., C.R. Ent. Soc. Belg. 1889, p.
Australia.

8004. BIFASCIATA, Reitt., MT. Münch. Ent. Ver. 1887, p. 13
Australia.

8005. COSTATIPENNIS, Blackb., Trans. R. Soc. S.A. x. 1887,
Western Victoria; Tasmania.

8006. MINOR, Blackb., l.c. p. 204.
S. Aust.; Port Lincoln, &c.

8007. NIGROMACULATUS, Blackb., l.c. p. 203.
S. Aust.; Woodville.

8008. NODIFER, Westw., Introd. Class. Ins. i. p. 155, t. 1
Blackb., l.c. p. 201.
Tasmania.

8009. PUNCTIPENNIS, Blackb., l.c. p. 204.
S. Aust.; Port Lincoln.

8010. SATELLES, Blackb., l.c. p. 202.
S. Aust.; Port Lincoln.

8011. SEMICOSTATUS, Blackb., l.c. p. 203.
S. Aust.; Port Lincoln.

8015. ANDERSONI, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 121.
S. Aust.; Port Lincoln District.

8016. AUSTRALIS, Blackb., l.c. p. 120.
S. Aust., Victoria, Tasmania.

8017. CONFERTA, Reitt., Verh. Ver. Brünn, xviii. p. 5.
Victoria.

8018. DILATIPENNIS, Reitt., Deutsche Ent. Zeit. 1878, i. p. 96 (=*foveola*, Beck.).
Australia.

8019. LINDENSIS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 120.
S. Aust; Port Lincoln District.

8020. SUBTILISSIMA, Reitt., Mitth. Münch. Ent. Ver. 1887, p. 139. n. 23.
Australia.

Family MYCETOPHAGIDÆ.

TRIPHYLLUS, Latreille.

8021. INTRICATUS, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 122.
Australian Alps.

8022. MINOR, Lea, P.L.S.N.S.W. (2) x. 1895, p. 226.
N.S. Wales; various localities. Queensland; Brisbane.

8023 MULTIGUTTATUS, Lea, l.c. p. 225.
N.S. Wales; Richmond River.

MYCETÆA, Stephens.

8024. PILOSELLA, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 122.
S. Aust.; near Port Lincoln.

DIPLOCŒLUS, Guérin.

8025. ANGUSTULUS, Blackb, Trans. R. Soc. S.A. xiv. 1891, p. 122.
S. Australia.

8028. Leai, Blackb., Trans. R. Soc. S.A. xviii.
N.S. Wales and Queensland.

8029. punctatus, Lea, P.L.S.N.S.W. (2) x. 18

N.S. Wales; Richmond River.

TYPHÆA, Stephens.

8030. fumata, Linn., Syst. Nat. I. 2. p. 564; I
Soc. S.A. x. 1887, p. 205.
S. Aust.; Port Lincoln.

Family DERMESTIDÆ

CRYPTORHOPALUM, Guérin.

8031. australicum, Blackb., Trans. R. Soc. S.A.
S. Aust.; near Port Lincoln.

8032. interioris, Blackb., l.c. p. 131.
S. Aust.; Basin of Lake Eyre.

8033. quornense, Blackb., P.L.S.N.S.W. (2) ix
S. Aust.; near Quorn.

8034. woodvillense, Blackb., Trans. R. Soc. S.A
S. Aust.; Woodville.

8037. ANTIPODUM, Blackb., Trans. R. Soc. S.A. xiv. 1891, p. 128.
S. Aust.; near Adelaide.

8038. BALDIENSE, Blackb., l.c. p. 127; l.c. xv. 1892, p. 208.
Victorian Alps.

8039. DIFFICILE, Blackb., l.c. p. 126.
S. Aust.; near Port Lincoln.

8040. EYRENSE, Blackb., l.c. p. 124.
S. Aust.; Basin of Lake Eyre.

8041. FROGGATTI, Blackb., l.c. xv. 1892, p. 34.
N.S. Wales; near Yass.

8042. LINDENSE, Blackb., l.c. xiv. 1891, p. 125.
S. Aust.; near Port Lincoln.

8043. MACLEAYI, Blackb., l.c. p. 126.
S. Australia and Victoria.

8044. MEYRICKI, Blackb., l.c. p. 128.
W. Australia.

8045. OCCIDENTALE, Blackb., l.c. p. 127.
W. Australia.

8046. REITTERI, Blackb., l.c. xv. 1892, p. 207.
N.S. Wales; near Sydney.

8047. SINGULARE, Blackb., l.c. xiv. 1891, 128; l.c. xv. 1892, 34.
S Aust.; near Port Lincoln.

8048. VARIPES, Blackb., l.c. xv. 1892, p. 208.
S. Aust.; near Adelaide.

8049. YORKENSE, Blackb., l.c. xiv. 1891, p. 127.
S. Aust ; Yorke's Peninsula.

ADELAIDIA, Blackburn.

8050. RIGUA, Blackb., Trans. R. Soc. S.A. xiv. 1891, p 130.
S. Australia.

ANTHRENUS, Geoffroy.

8051. FLINDERSI, Blackb., Trans. R. Soc. S.A. xiv. 189
S. Aust.; near Port Lincoln.

8052. OCELLIFER, Blackb., l.c. p. 132.
S. Australia.

8053. VARIUS, Fab., Syst. Ent. p. 60; Erichs., Nat. I
455; Blackb., l.c. p. 132.
Australia (probably introduced).

8054. SOCIUS, Lea, P.L.S.N.S.W. (2) x. 1895, p. 228.
N.S. Wales; Sydney.

Family BYRRHIDÆ.

BYRRHUS, Linné.

8055. RAUCUS, Blackb., Trans. R. Soc. S.A. xiv. 1891,
Victorian Alps.

8056. TORRENSENSIS, Blackb., l.c. xii. 1889, p. 138.
S. Aust.; Torrens River.

ASPIDIPHORUS, Latreille.

Family HETEROCERIDÆ.

HETEROCERUS, Fabricius.

8060. Flindersi, Blackb., Trans. R. Soc. S.A. x. 1887, p. 205.
S. Aust.; Port Lincoln, &c.

8061. indistinctus, Blackb., l.c. xiv. 1891, p. 134.
Victoria; Ovens River.

8062. multimaculatus, Blackb., l.c. x. 1887, p. 205.
S. Aust.; Torrens River.

8063. victoriæ, Blackb., l.c. xiv. 1891, p. 133.
Victorian Alps.

Family LUCANIDÆ.

Sub-Family LUCANIDES.

PHALACROGNATHUS, Macleay.

8064. Westwoodi, Shipp., Trans. Ent. Soc. Lond. 1893, p. 428.
N. Queensland; Cape York.

CLADOGNATHUS, Burmeister.

8065. limbatus, C. O. Waterh., Ann. Nat. Hist. 1887, p. 381.
N. Queensland; Cape York, &c.

CERATOGNATHUS, Westwood.

8066. Froggatti, Blackb., P.L.S.N.S.W. (2) ix. 1894, p. 94.
N.S. Wales; Botany.

8067. Gilesi, Blackb., Trans. R. Soc. S.A. xix. 1895, p. 215.
Victoria.

FIGULUS, W. S. Macleay.

8068. TRILOBUS, Westw., Ent. Mag. v. 1838, p. 263.
N.S. Wales.

Family SCARABÆIDÆ.

Sub-Family COPRIDES.

CEPHALODESMIUS, Westwood.

8069. CORNUTUS, Macl., P.L.S.N.S.W. (2) ii. 1887, p. 220
N. Queensland; Mossman River.

EPILISSUS, Reiche.

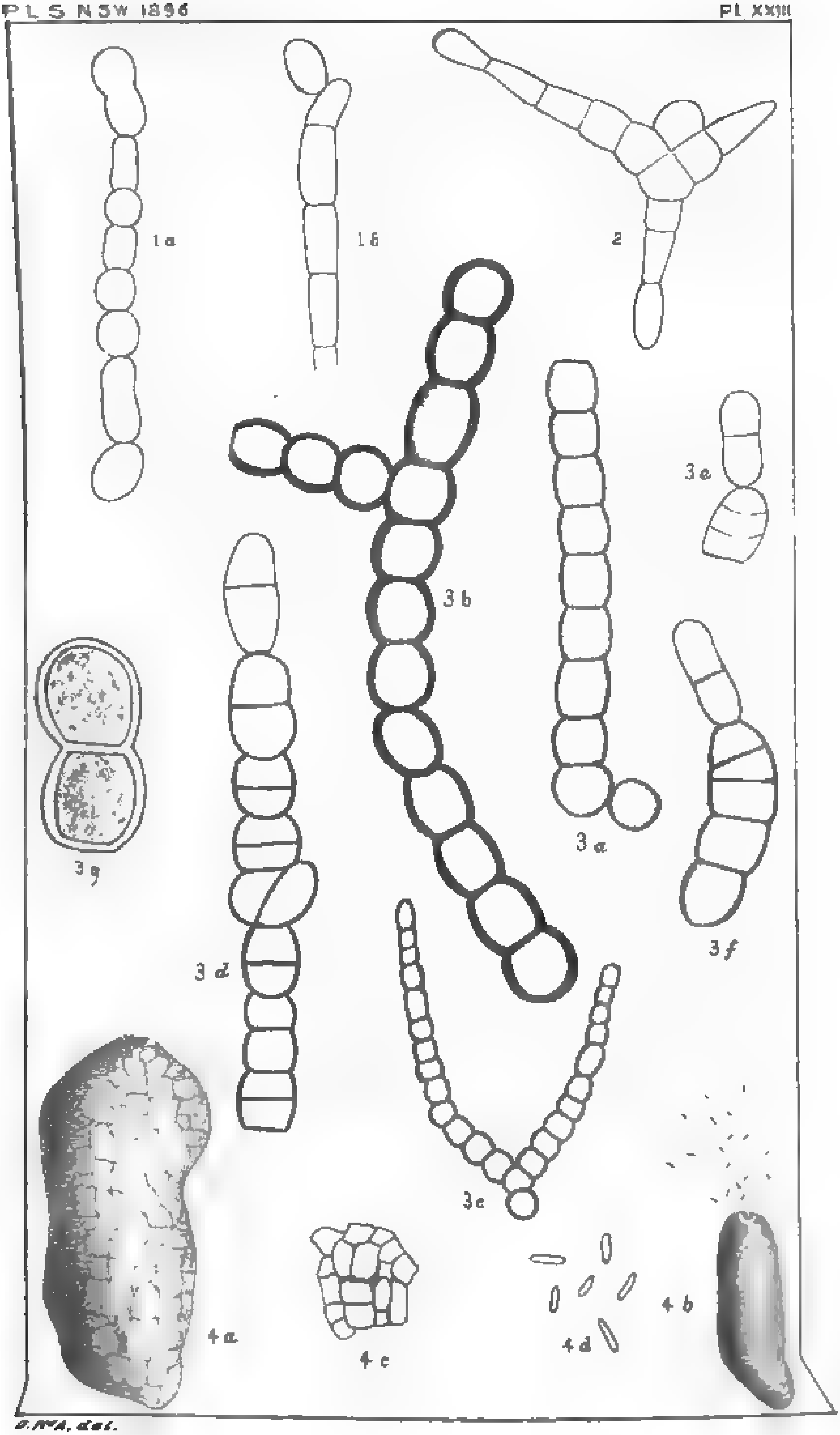
8070. GLOBULUS, Macl., P.L.S.N.S.W. (2) ii. 1887, p. 222
N. Queensland; Cairns.

GESSERODON, Hope.

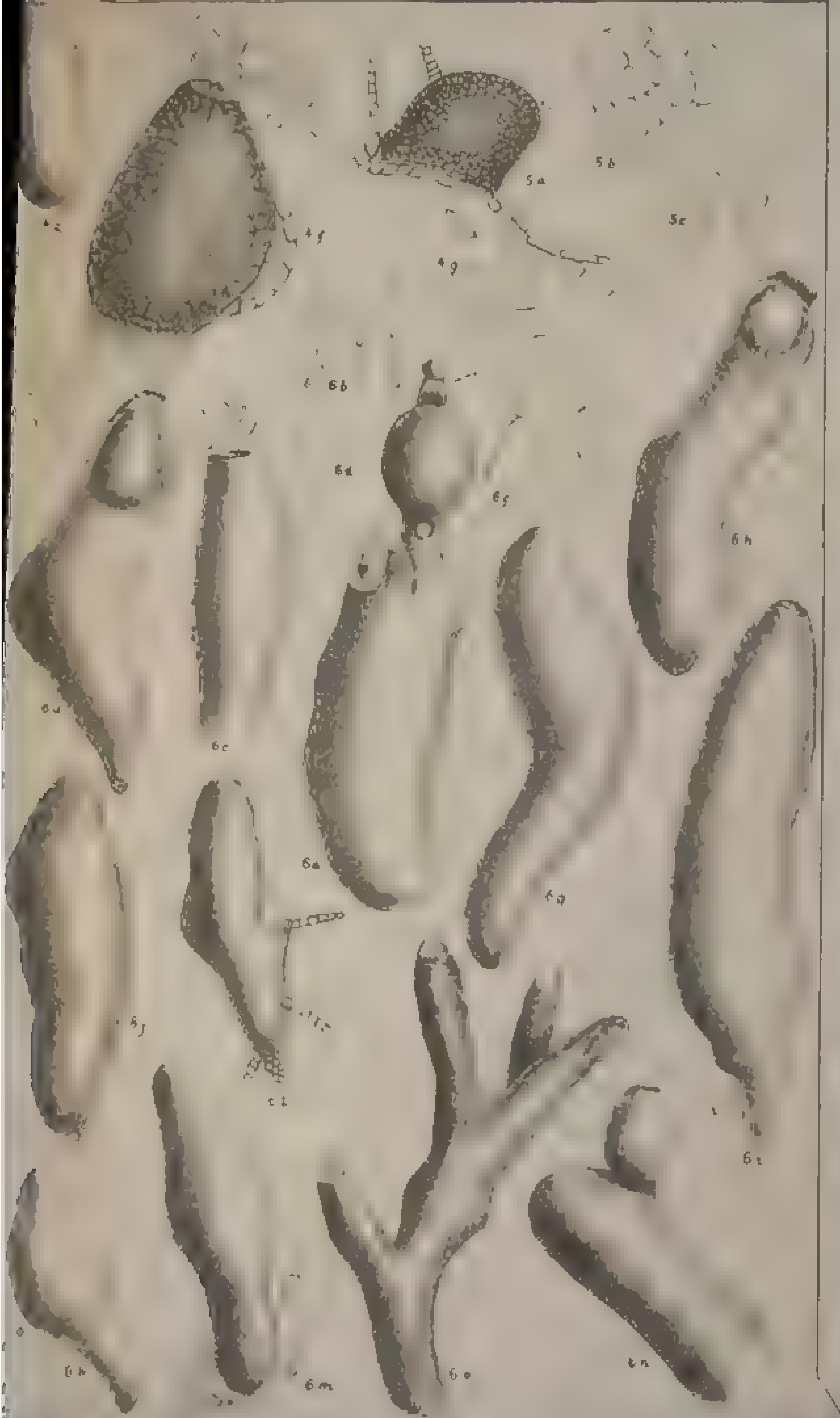
8071. GESTROI, Lansb., Ann. Mus. Civ. Genov. (2) ii. 1885,
N. Queensland; Cape York.

8072. VARIOLOSUS, Macl., P.L.S.N.S.W. (2) iii. 1888, p. 8
N.W. Aust.; King's Sound.

[redacted]

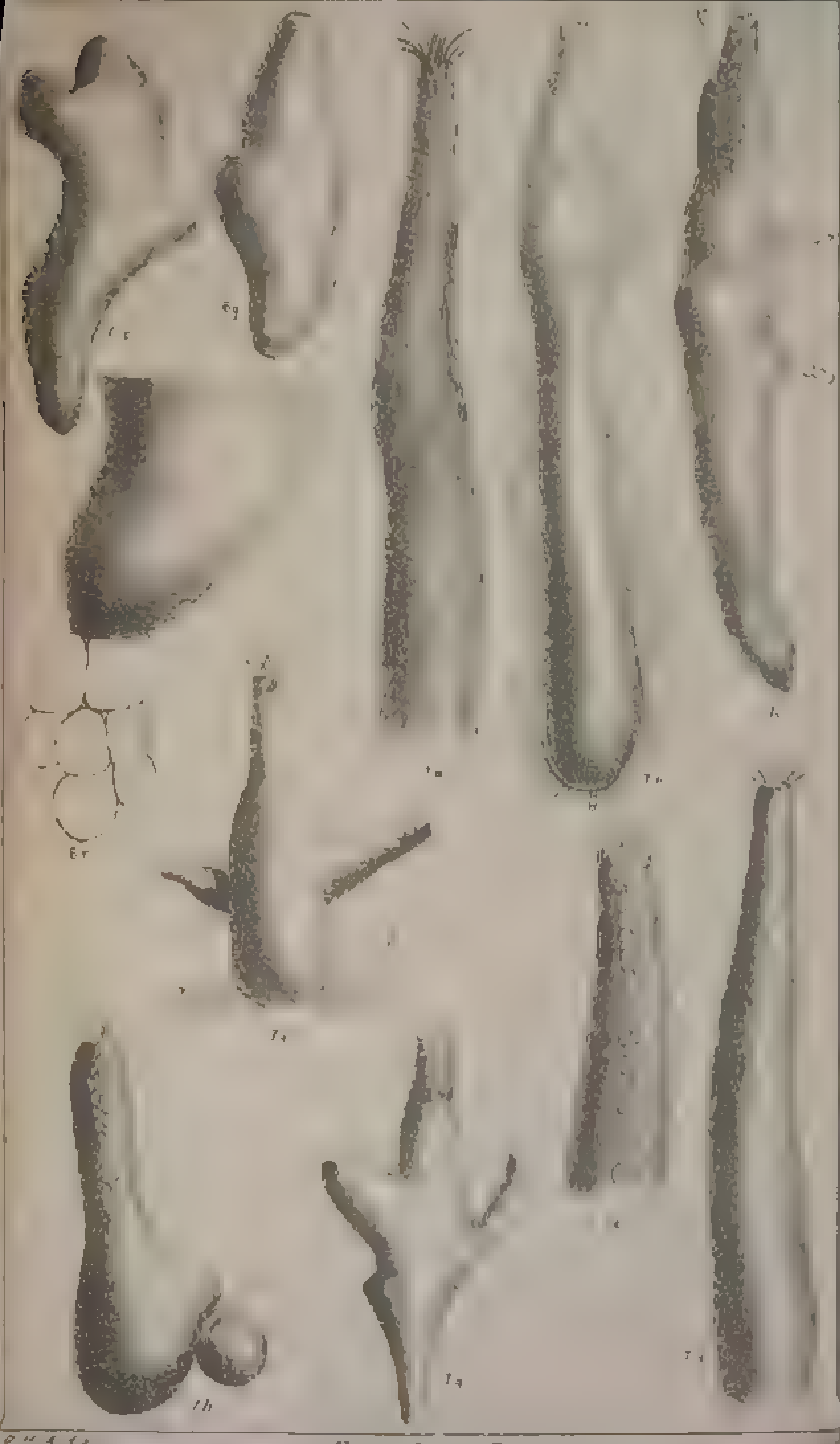


CAPNODIUM CITRICOLUM, McALP.

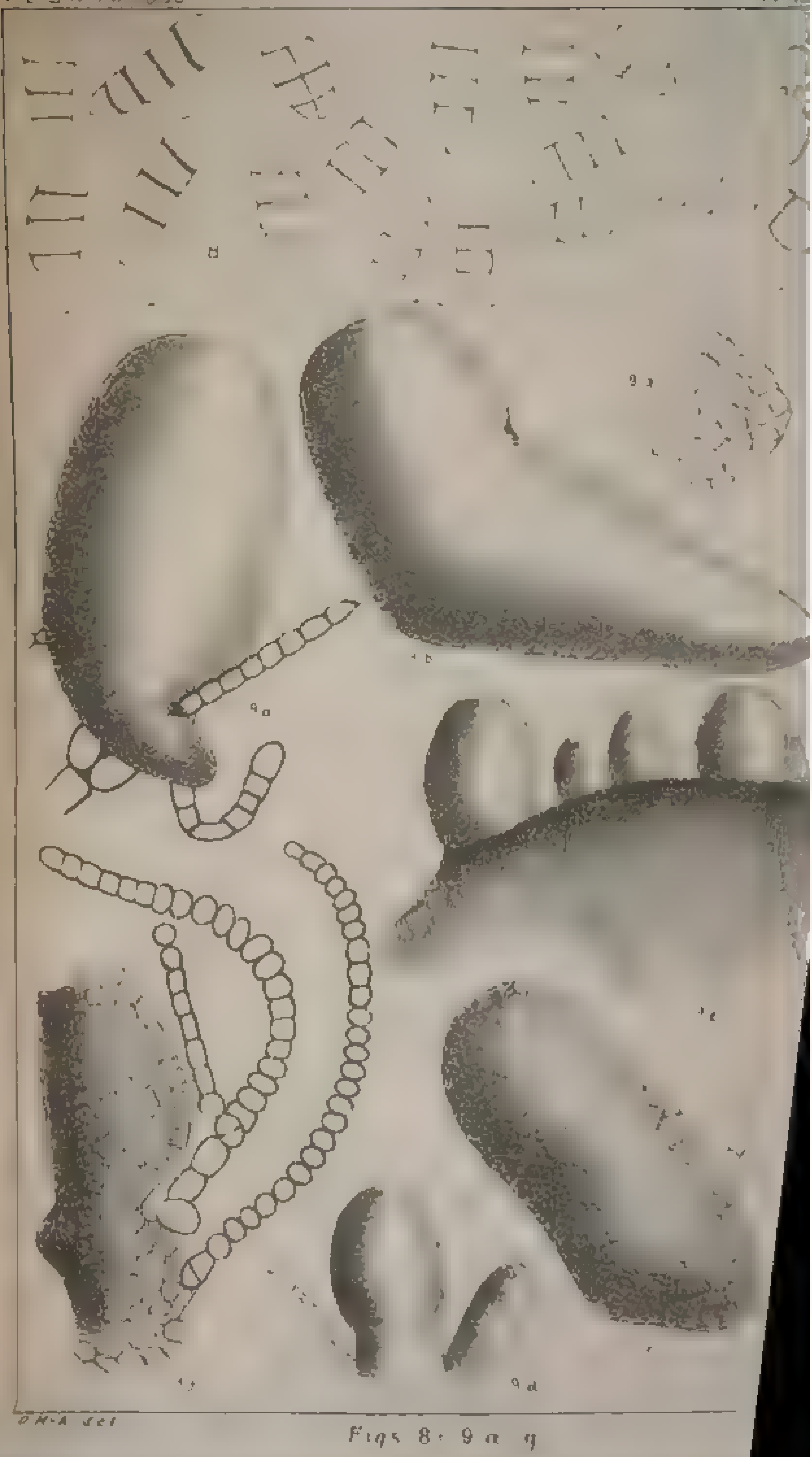


A. del.

Figs 4 e-g, 5 a-c, 6 a-o.

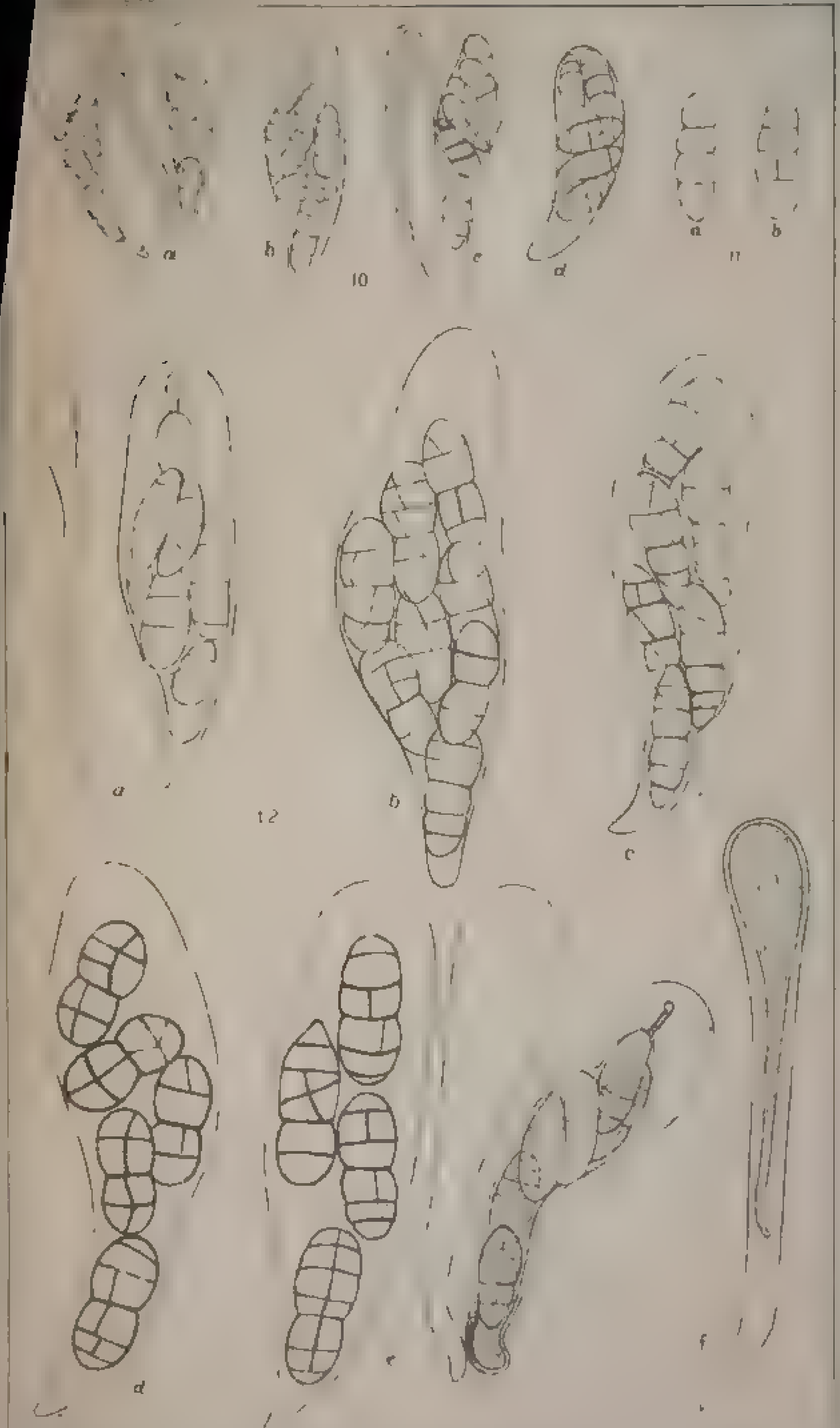


F. 75 6p-r, 7a-h



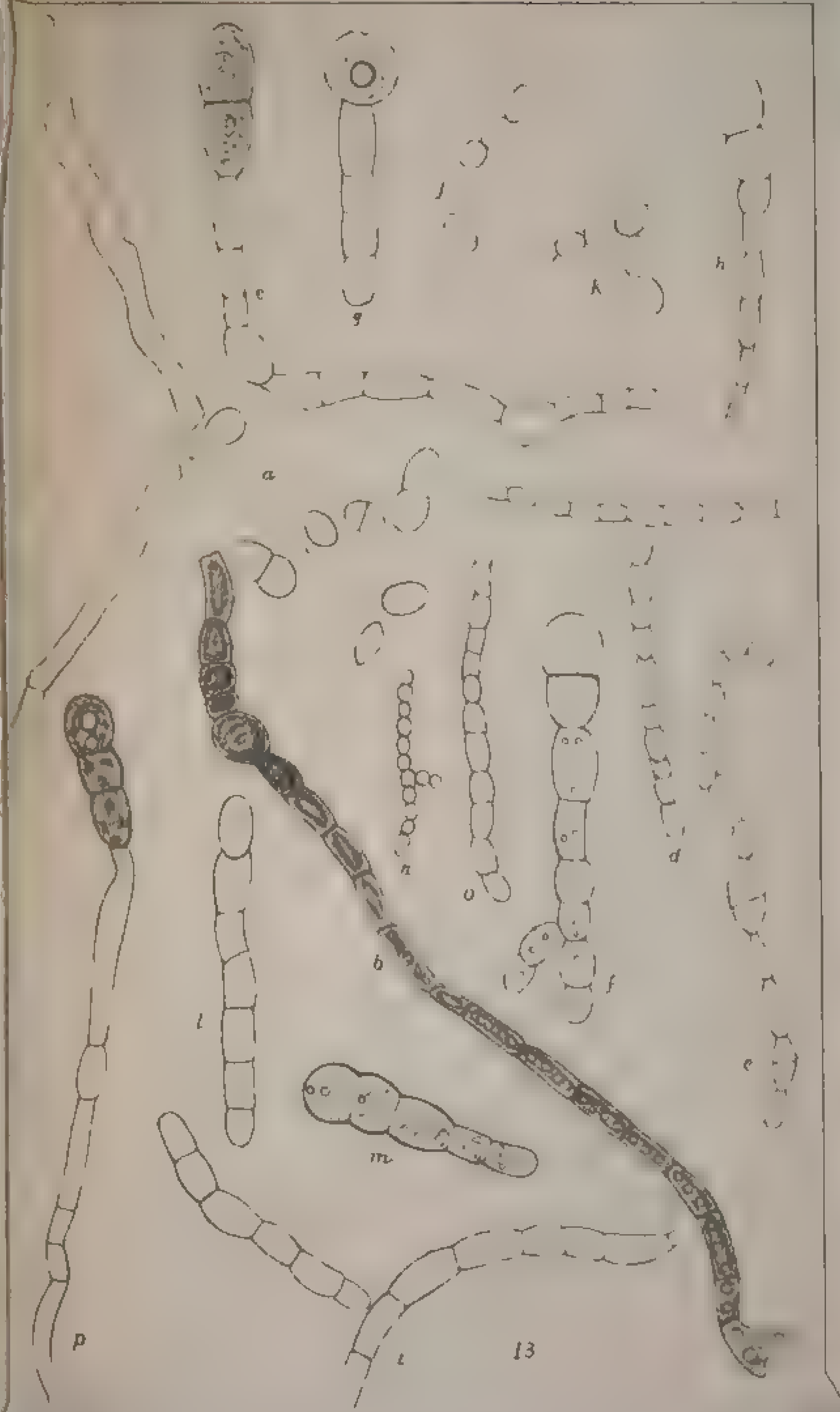
D. H.-A. del.

Figs. 8: 9 a–g



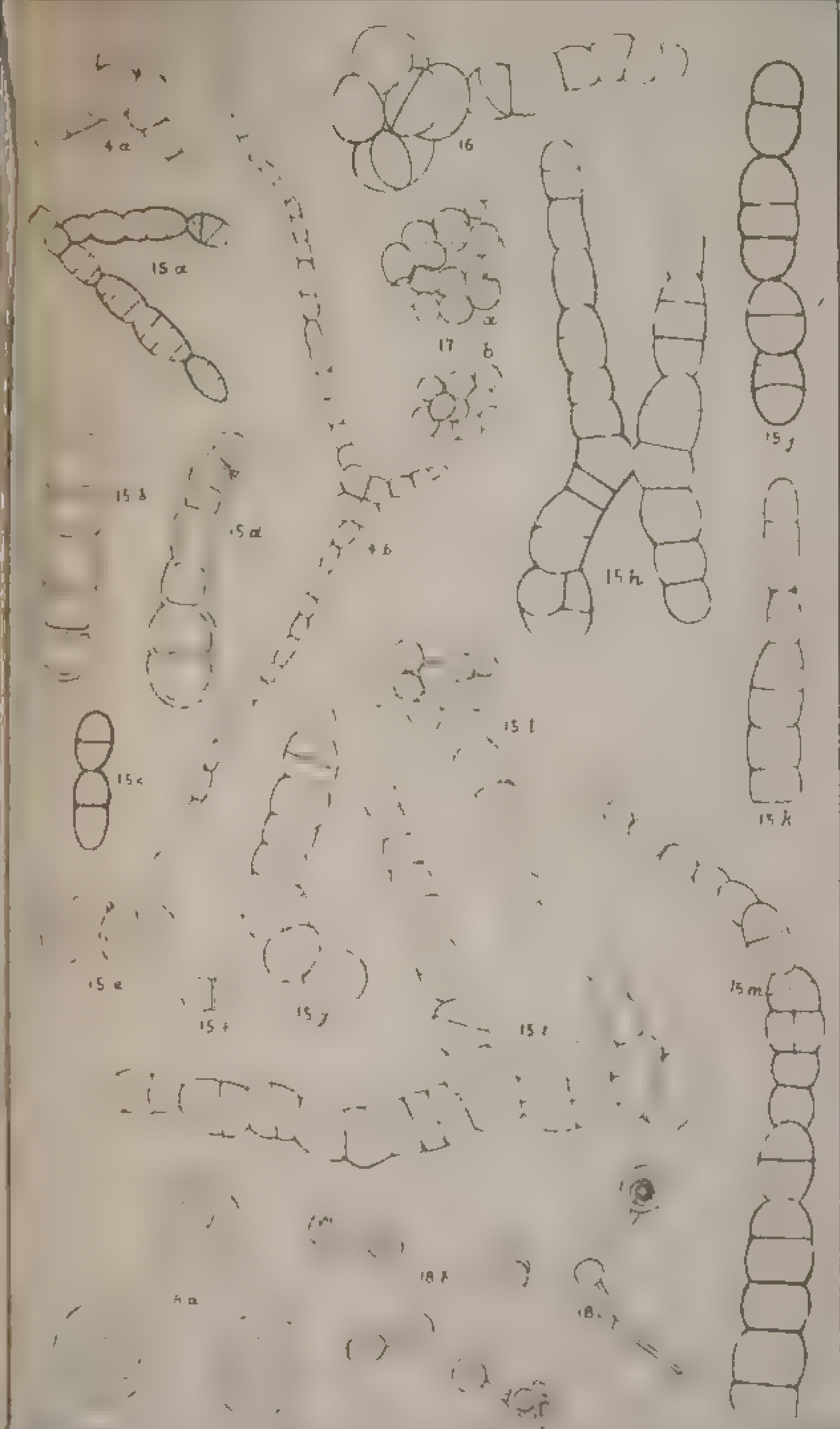
C.H.A. del.

Figs 10a–d, 11a b, 12a–f



R.H.C.A. del.

Figs. 13 a–p



[illegible] del.

Figs. 14 a b, 15 a–m, 16, 17 a b, 18 a–c.

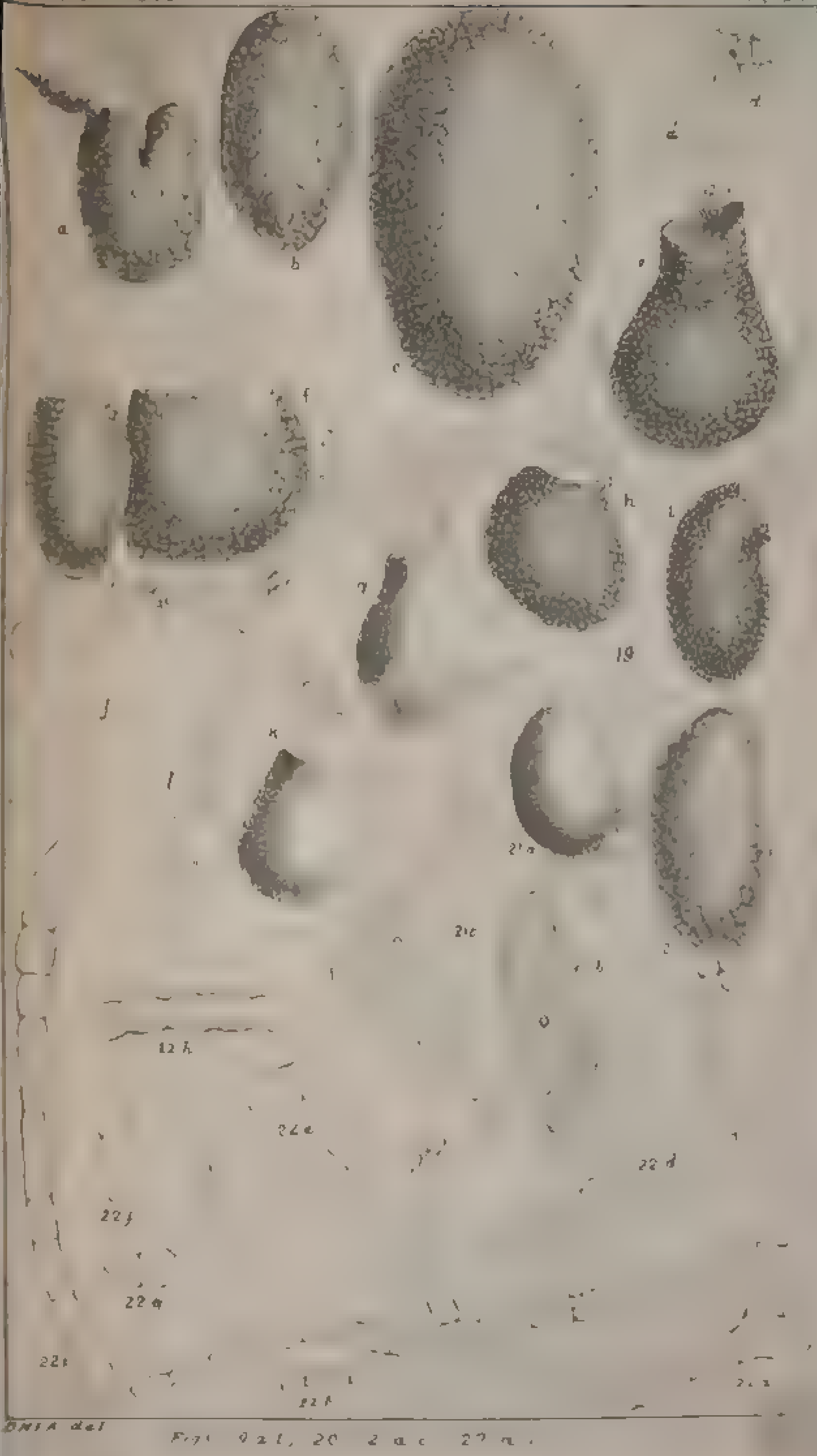
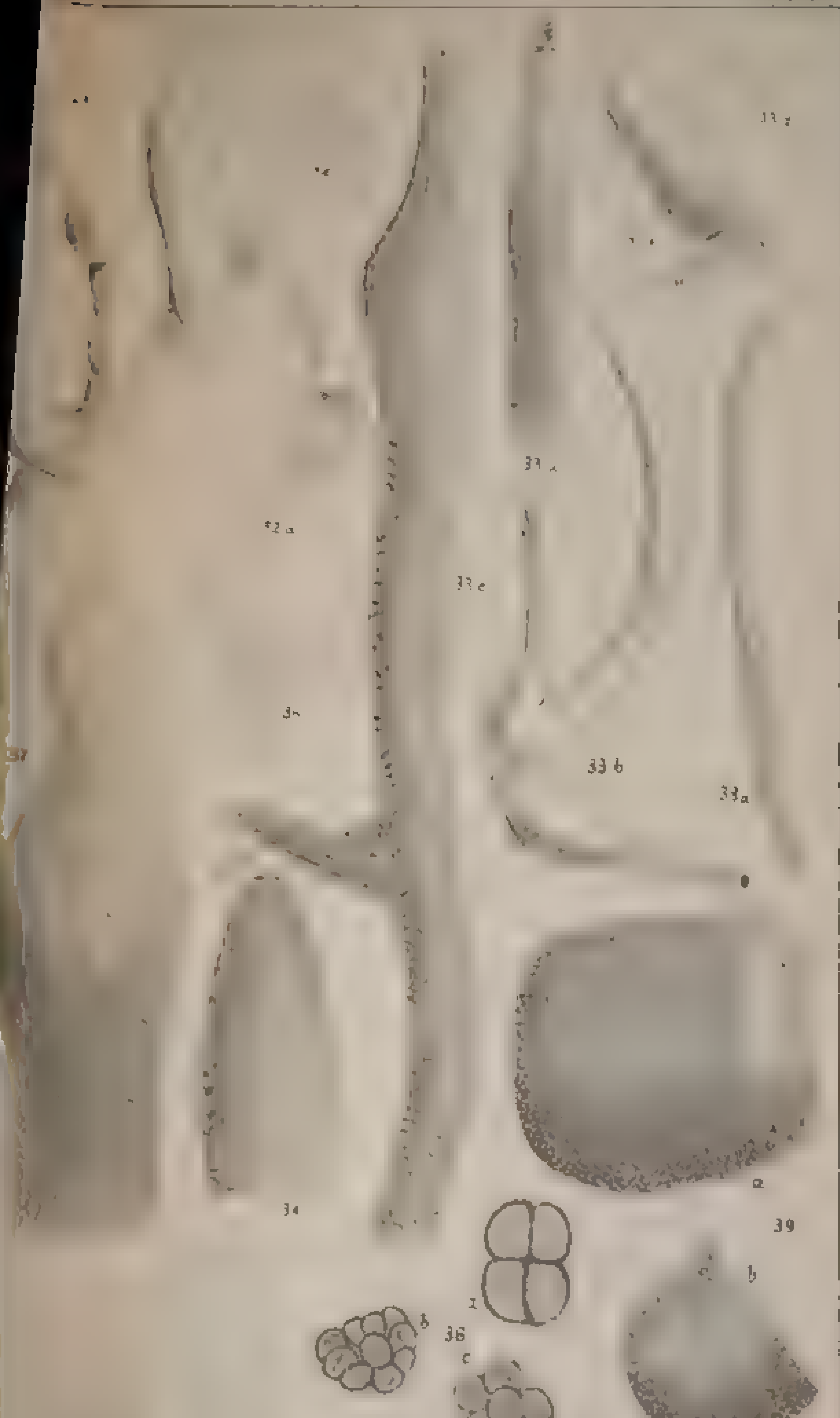
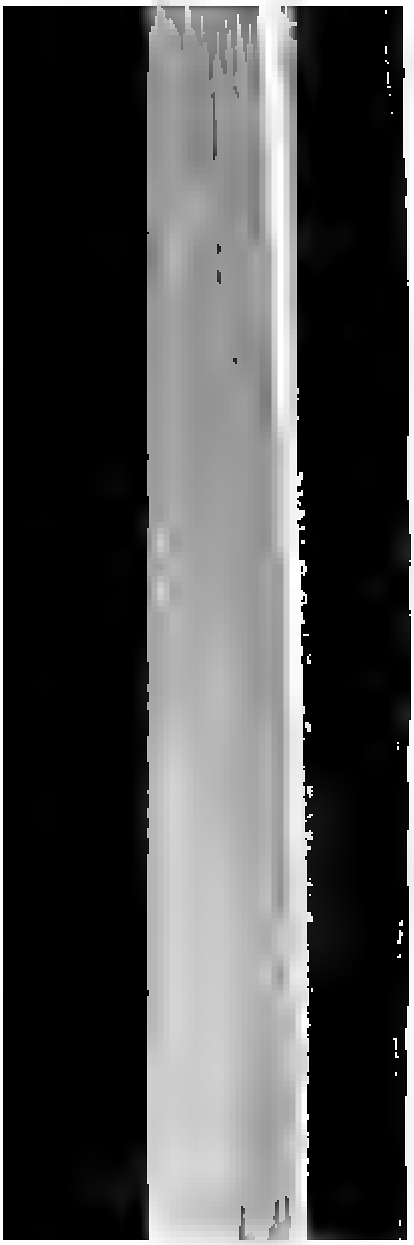
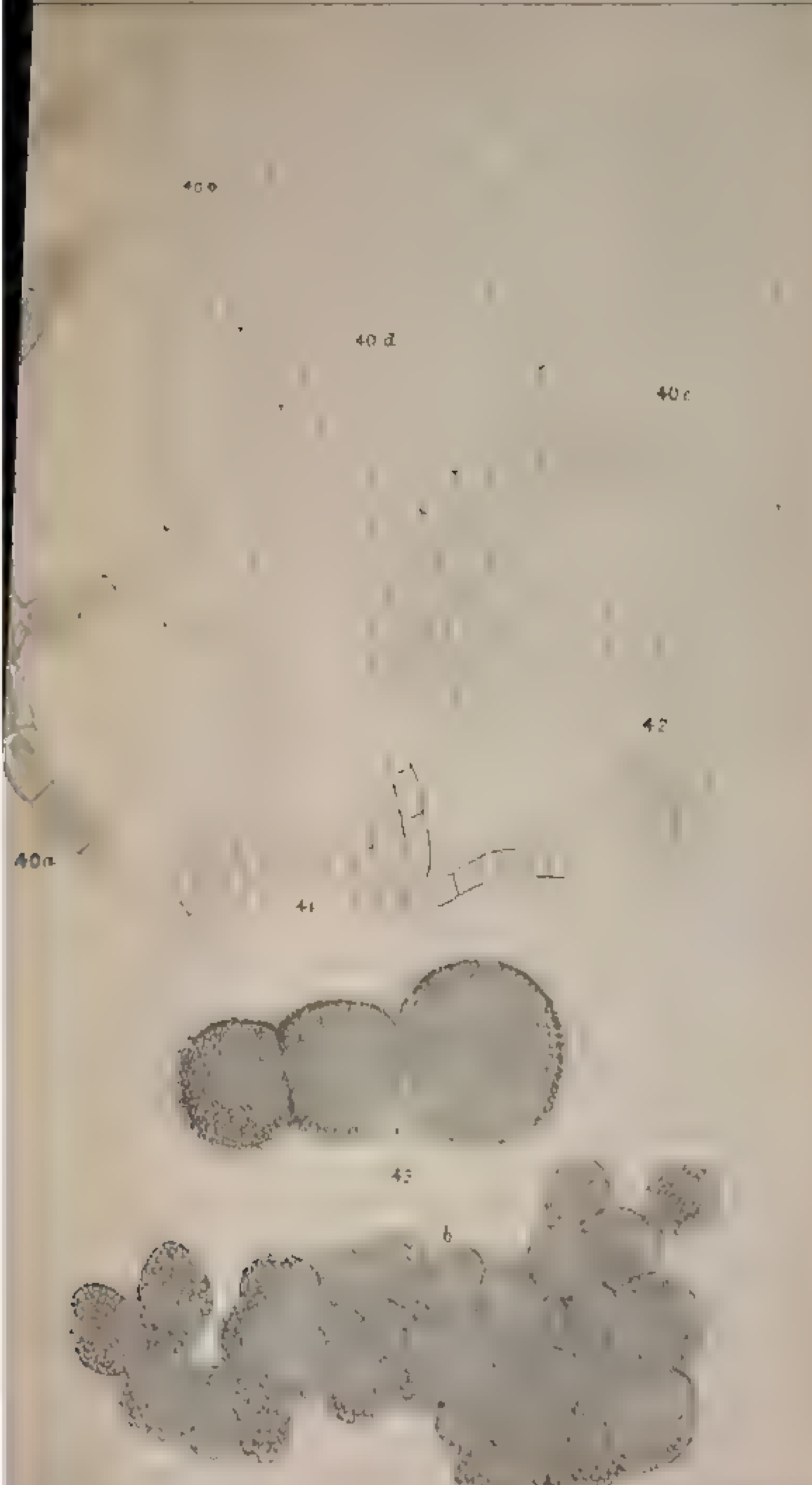


Fig. 19 a-l, 20, 21 a-c, 22 a-h.

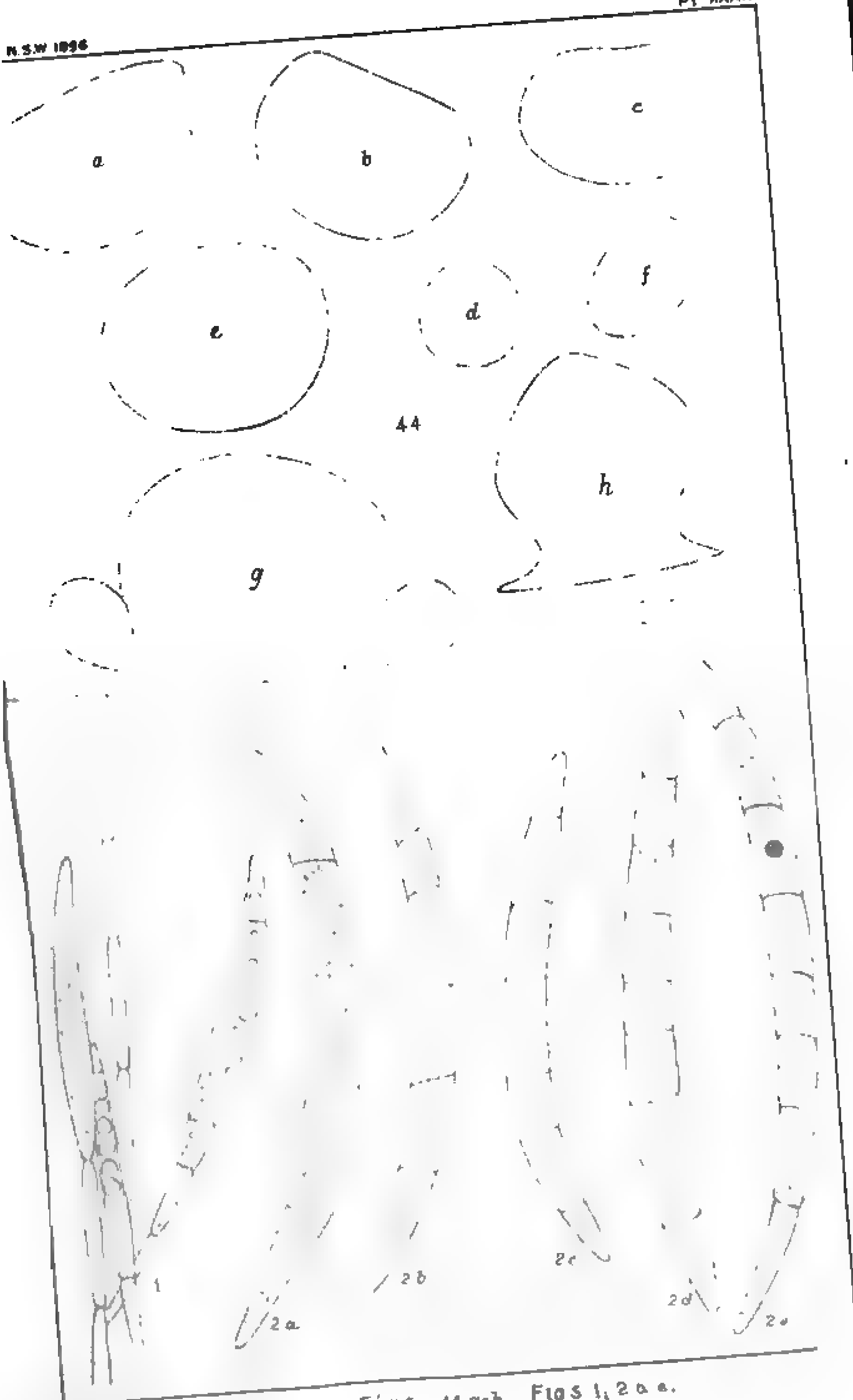


33a-g, 34, 35 a b, 36. 37, 38 b c 39 a b





Figs 40 a α, 41, 42 a b 43 a b

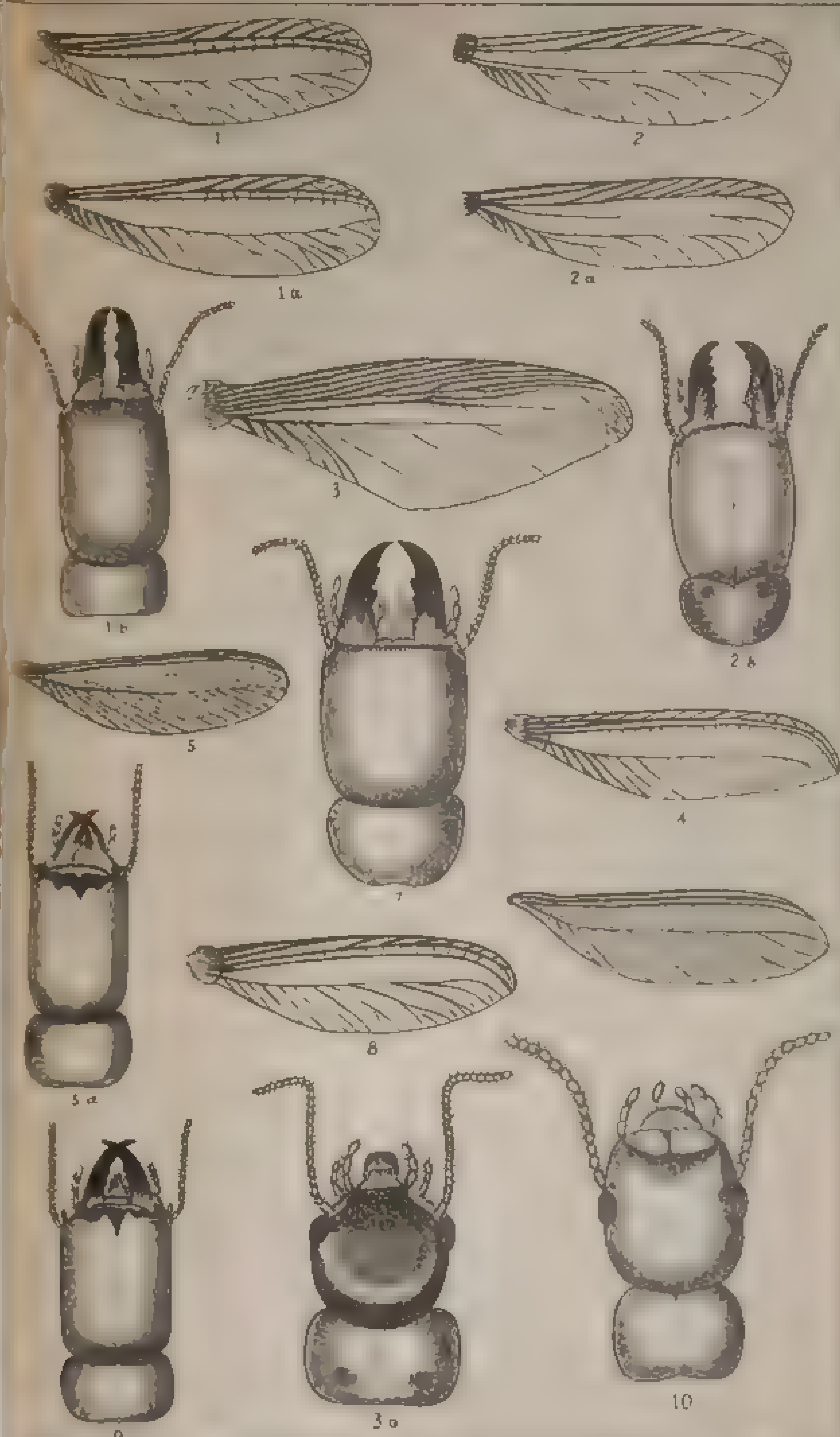


ONIA del.

Figs. 44 a-h. Figs 1, 2 a-e.

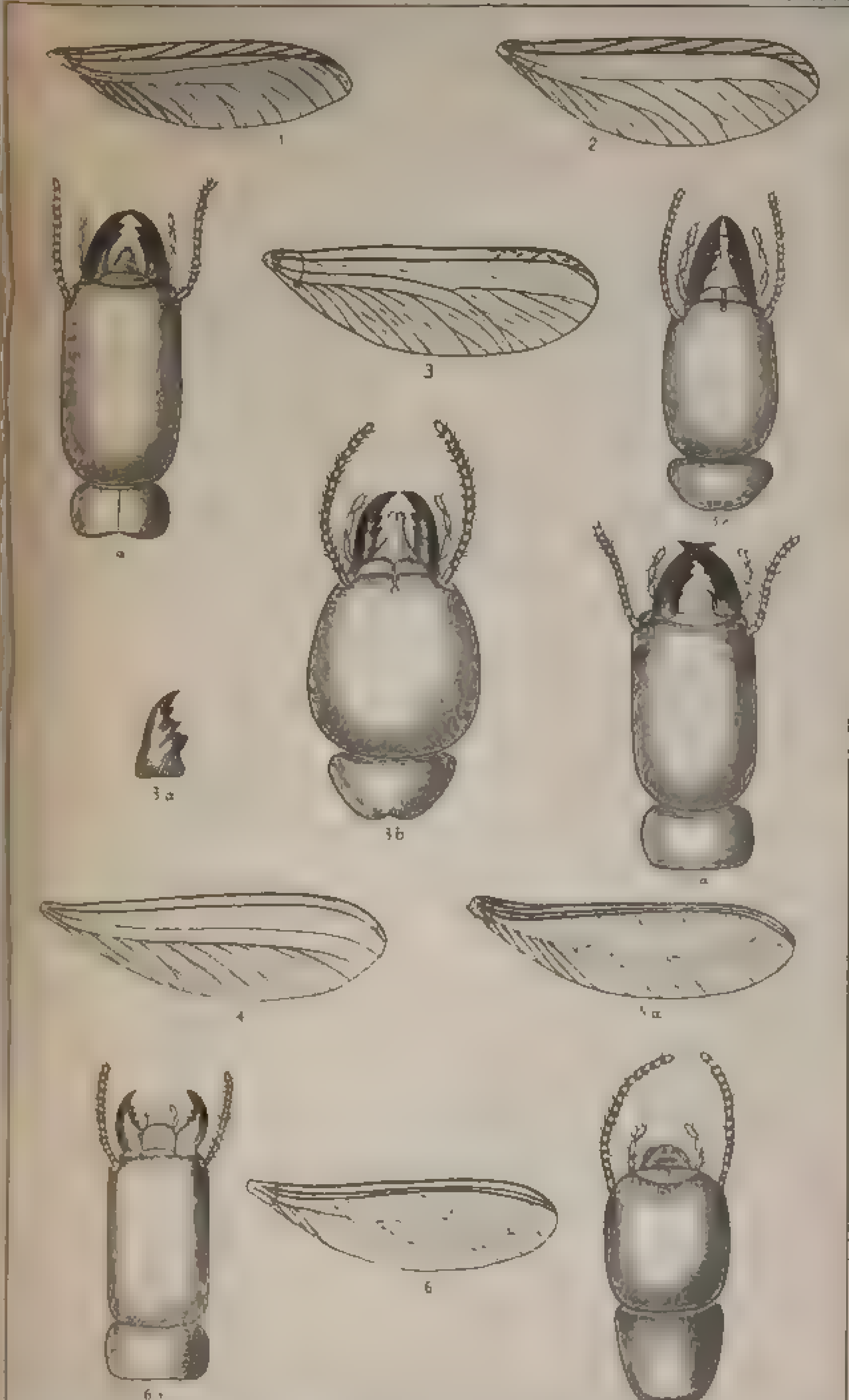
E. McA. del.

Figs. 44 a-h. Figs 1; 2 a-e.



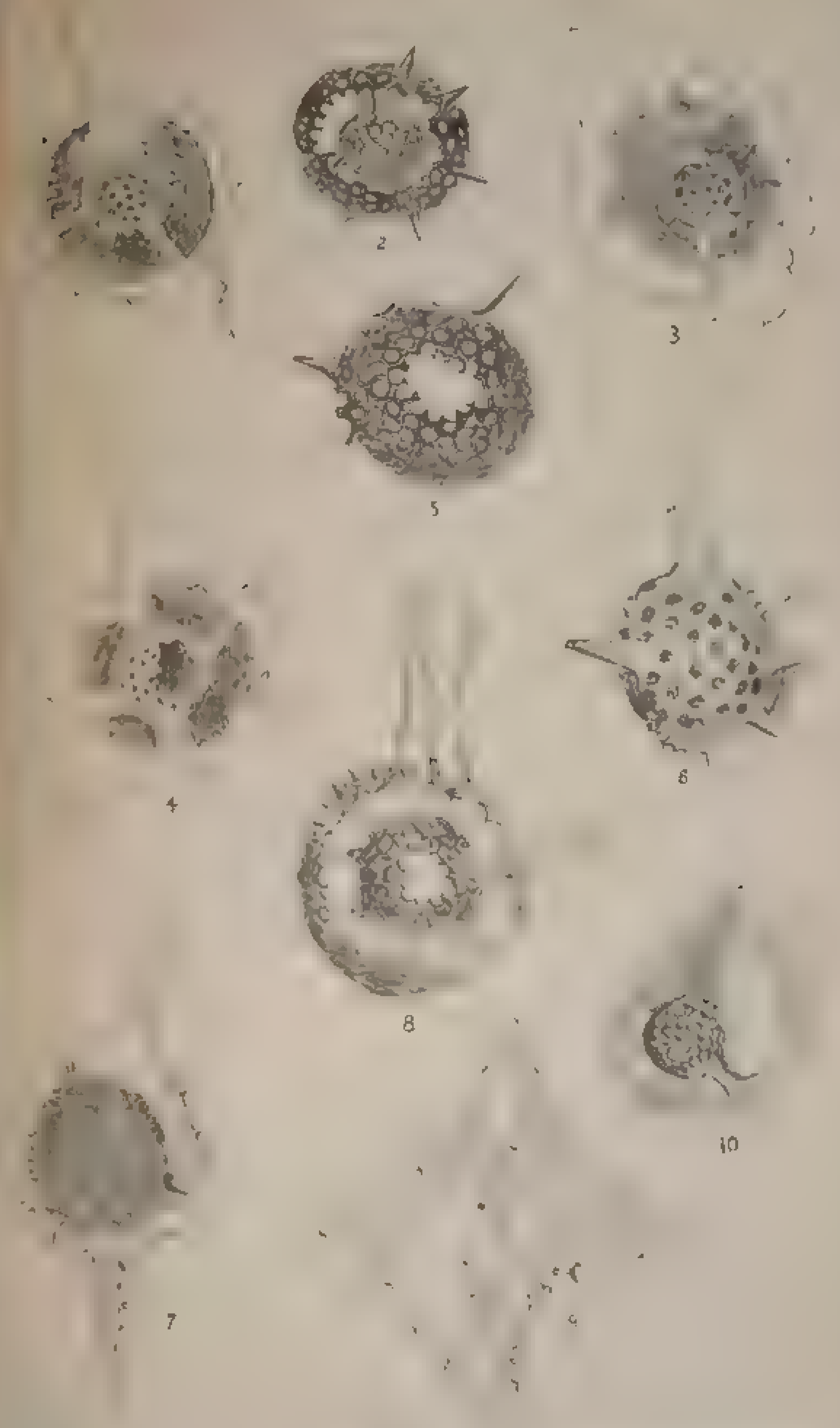
W W F del.

[illegible] TERMITES



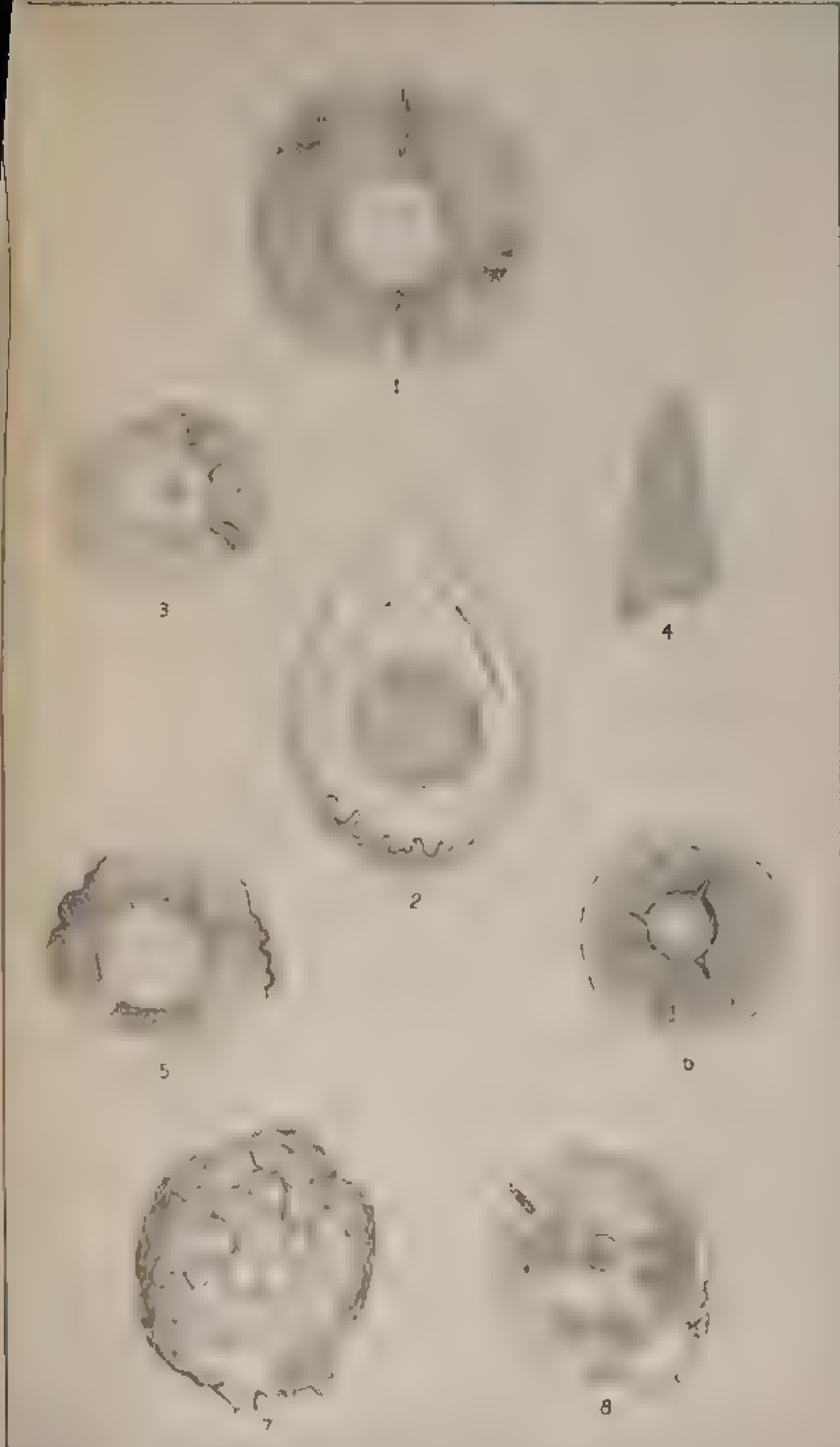
W.W.F. del.

Radiolarian Rock



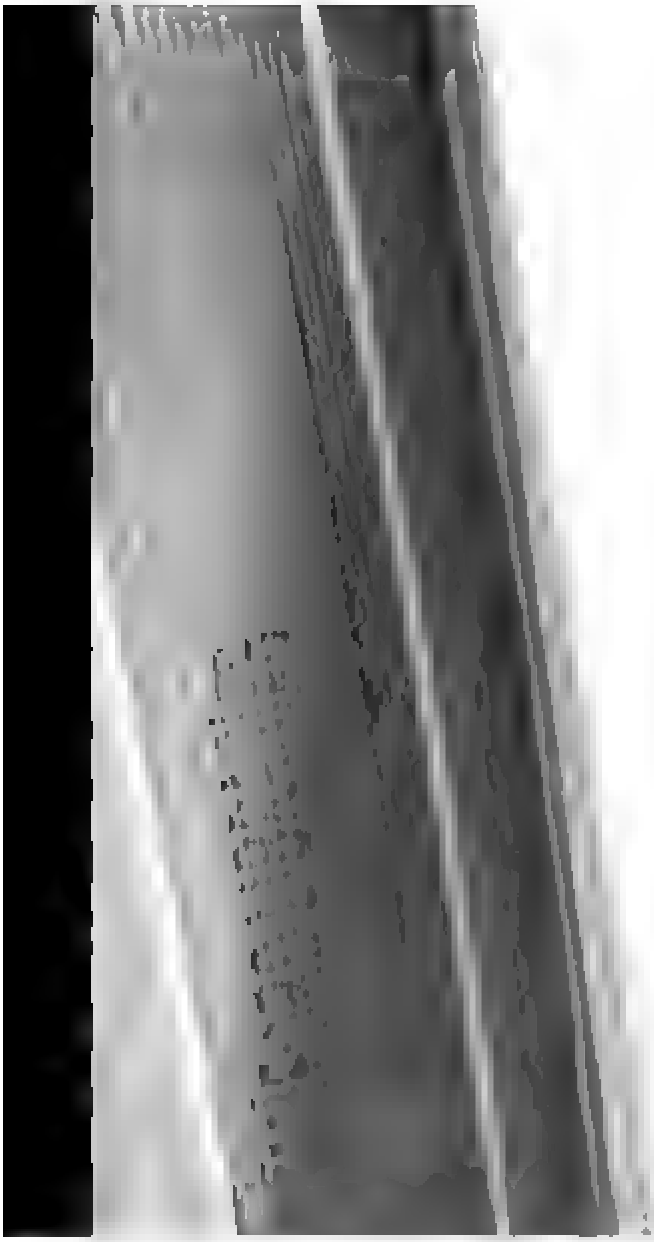
T W E D del.

PALAEOZOIC RADIOLARIA



F.W.E.C. del.

CASTS OF RADIOLARIA.



... to MURRAY BRIDGE, SOUTH-AUSTRALIA

...n? Rocks, which latter contain casts of Radiolaria at

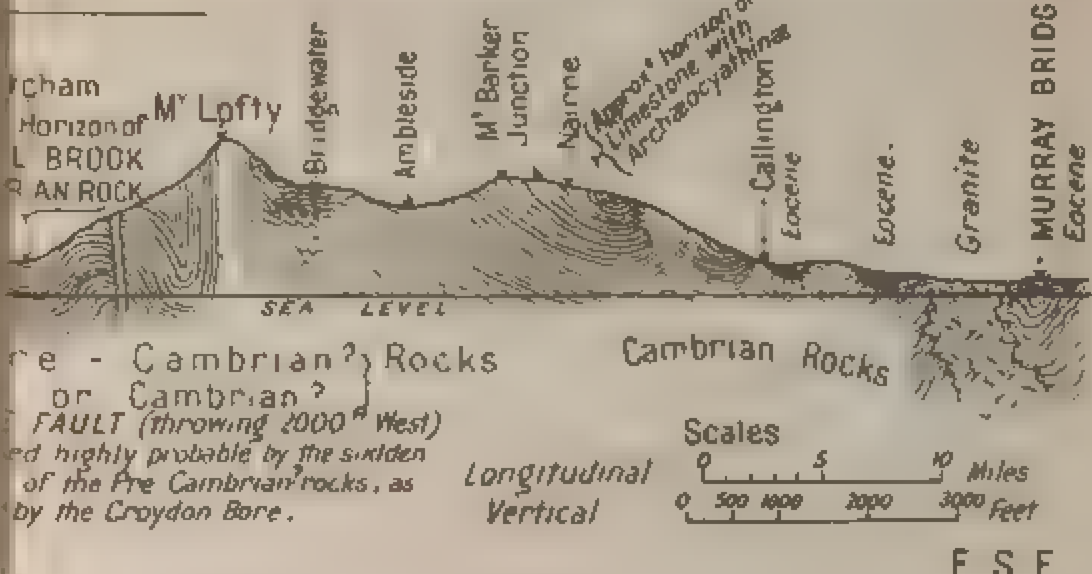
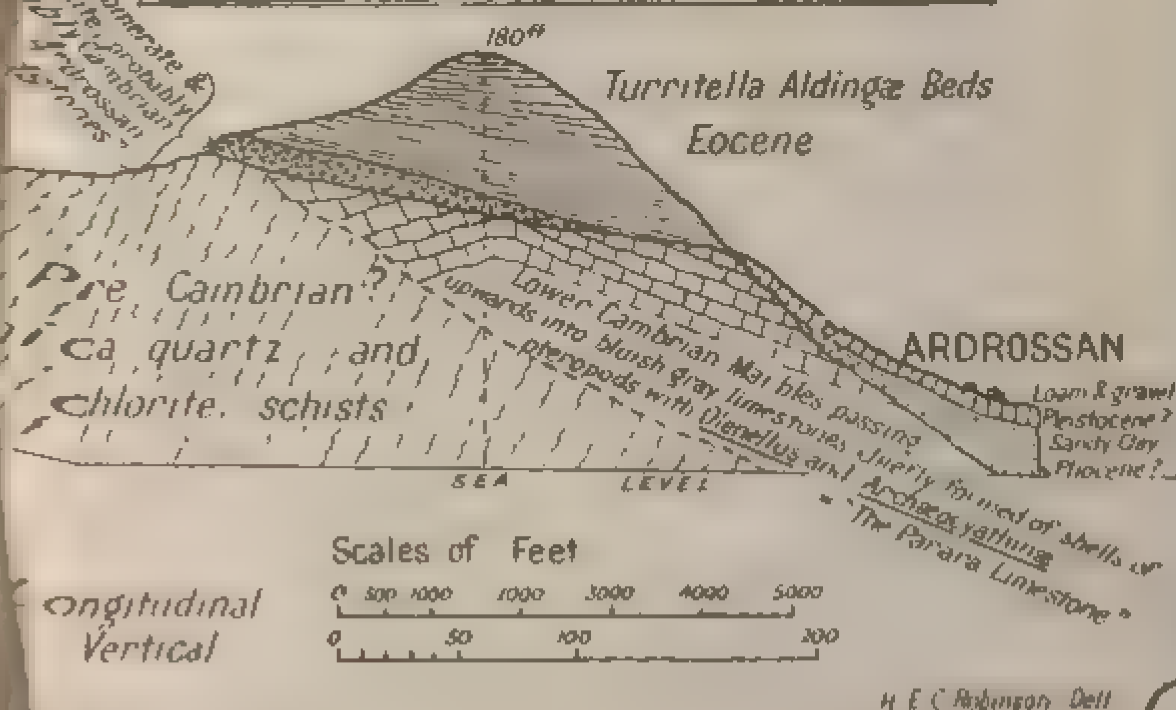
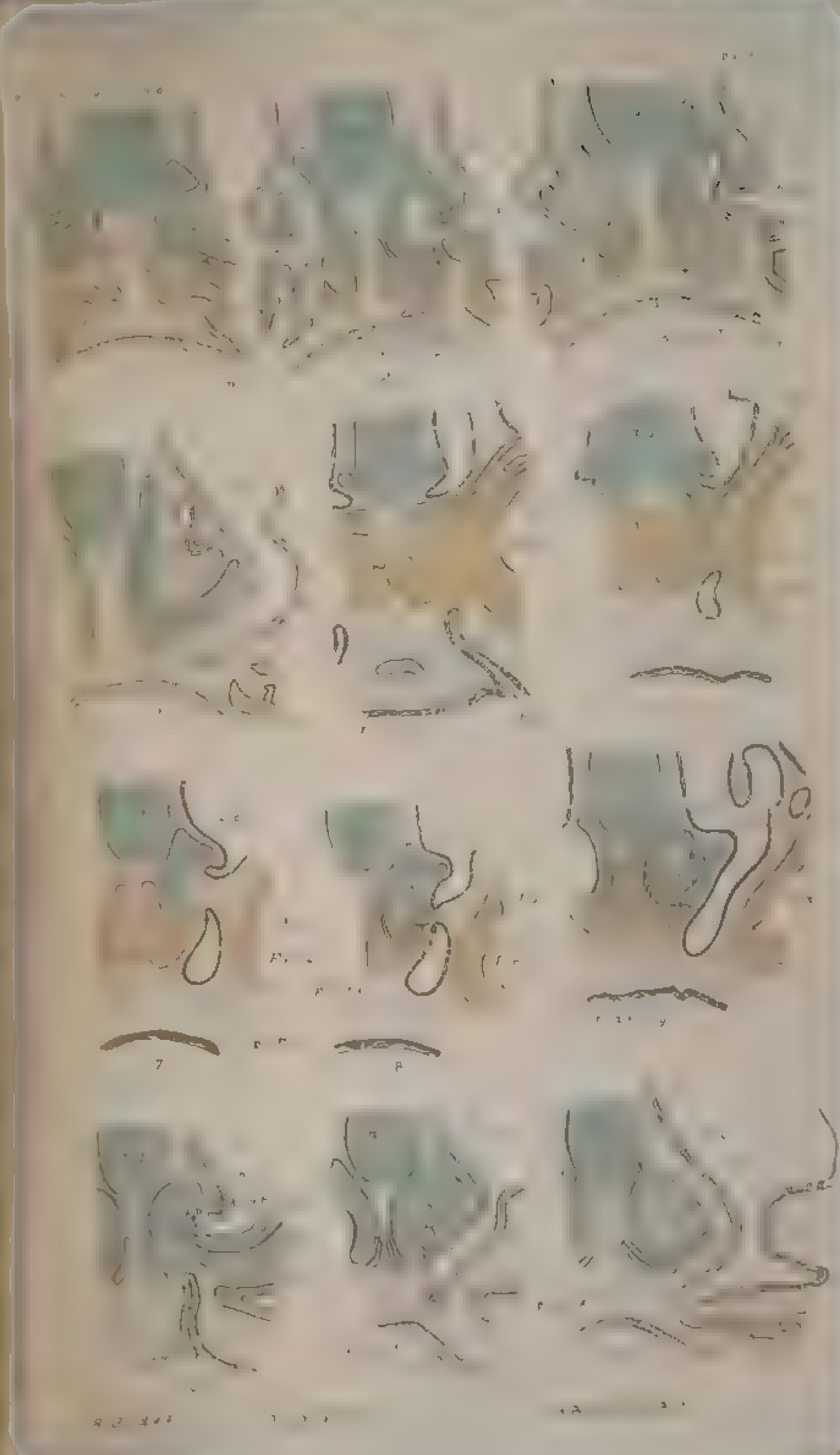


Fig 2

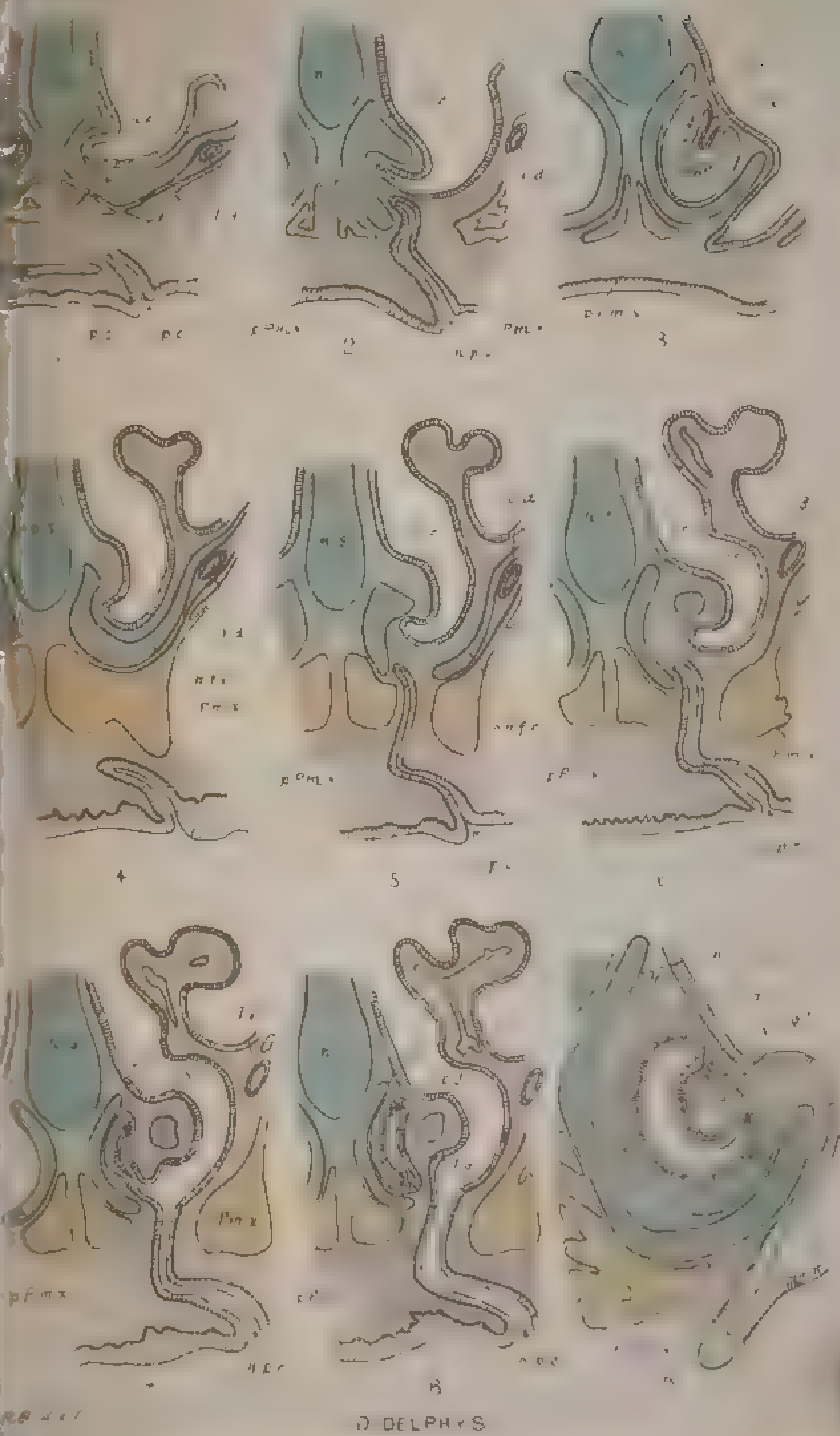
Showing probable junction between the Lower Cambrian and the Pre-Cambrian Rocks near ARDROSSAN, Yorkes Peninsula. S. A.



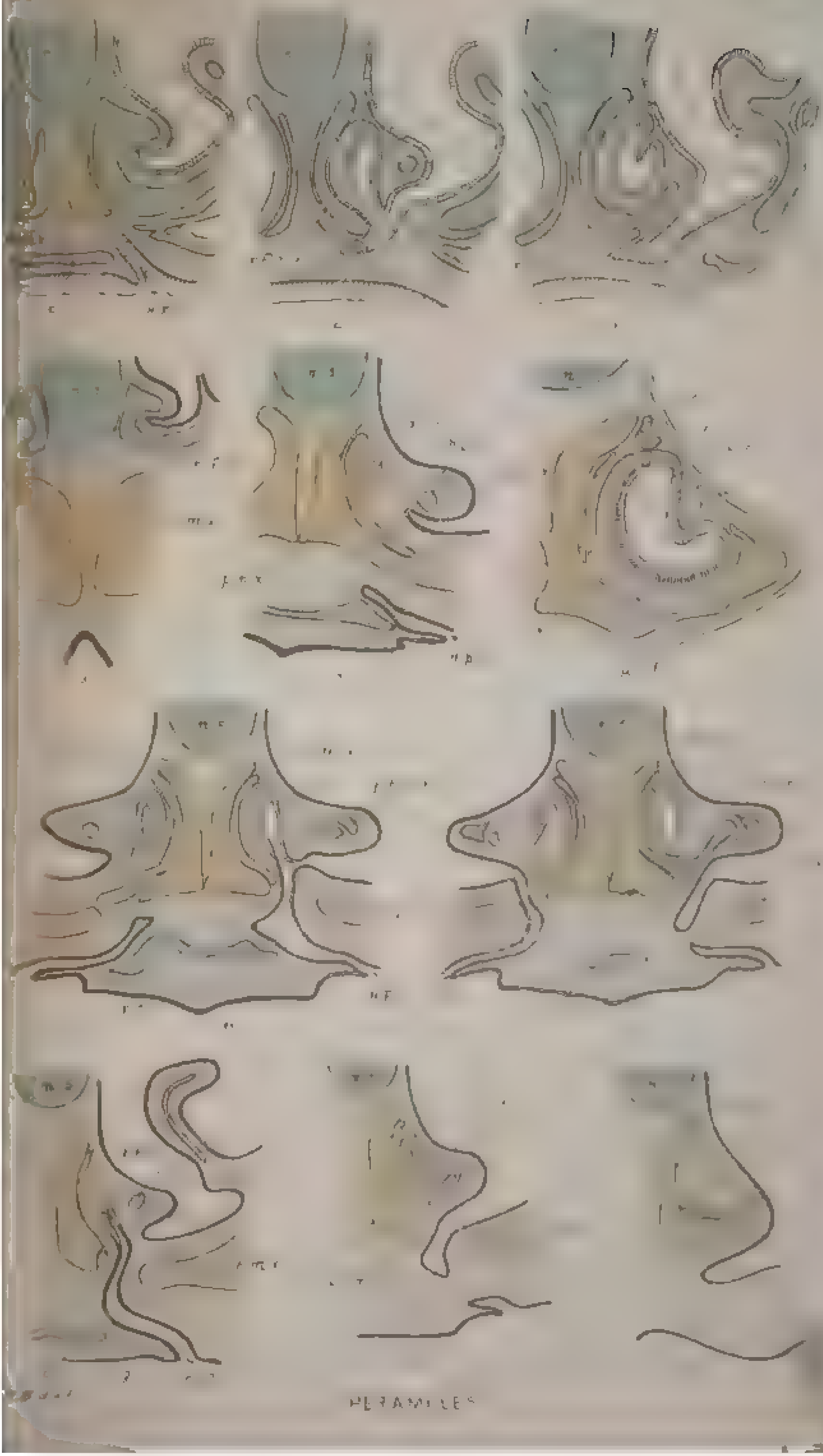
H. E. C. Robinson Delt



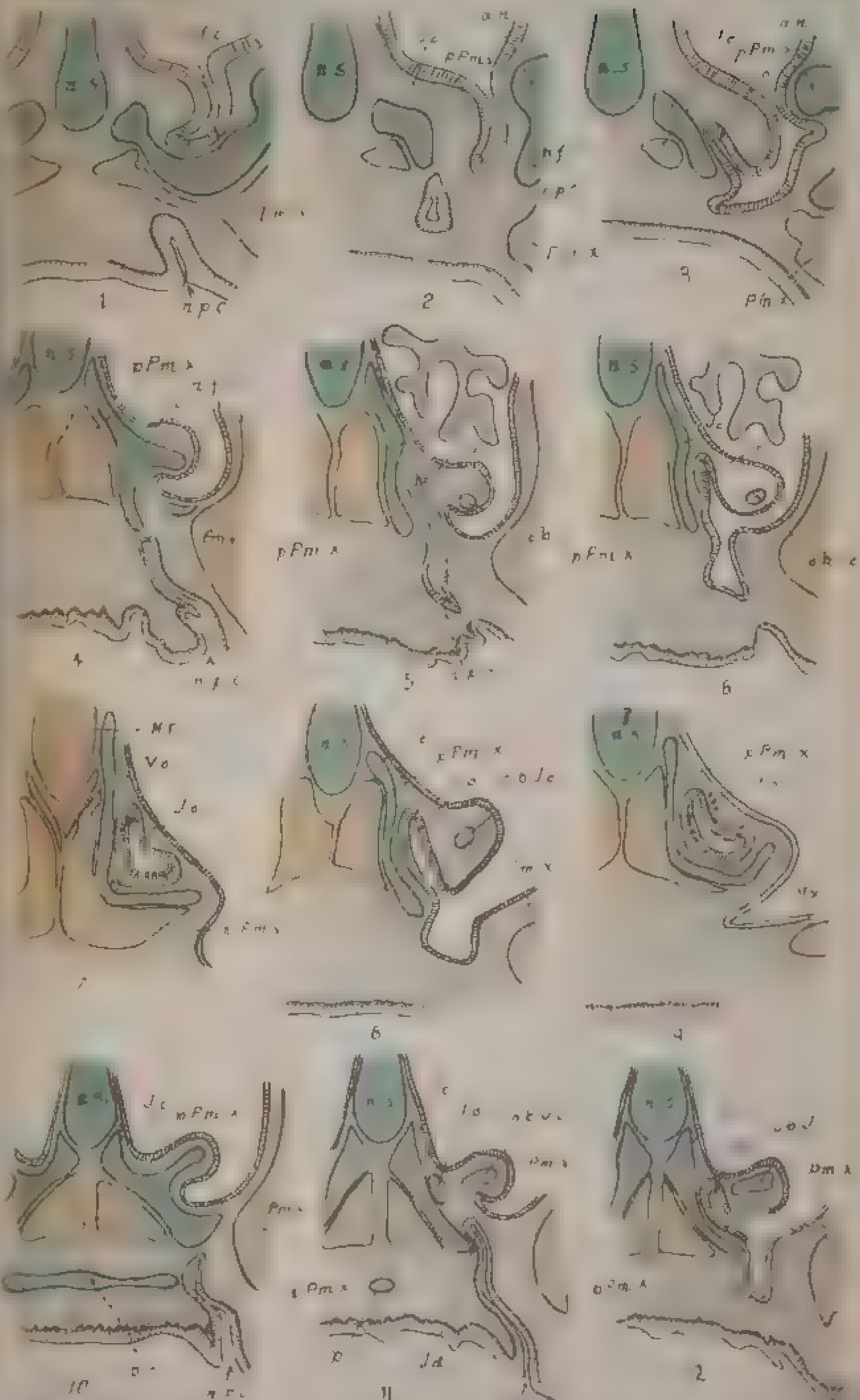
7
8



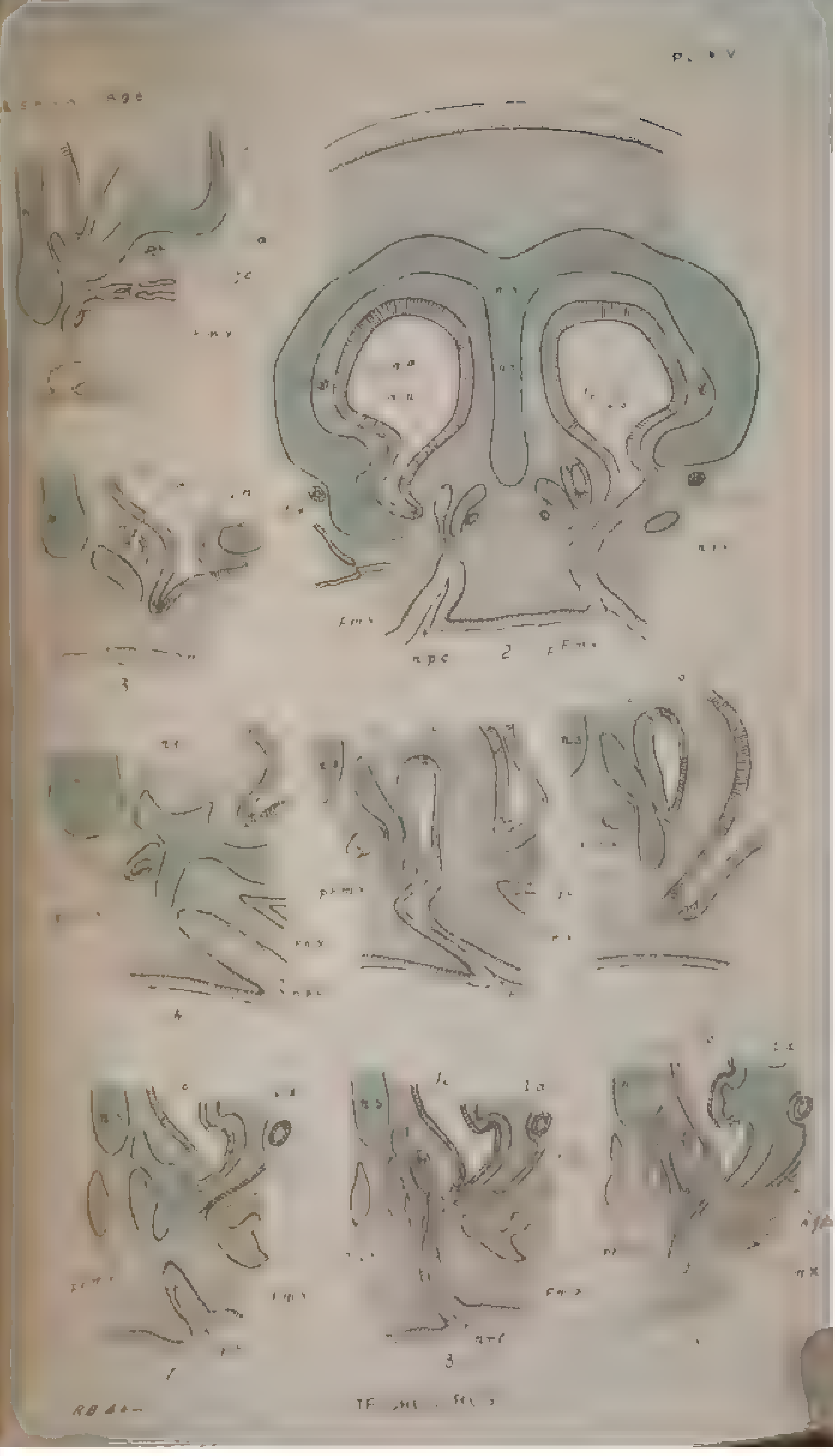
DIDELPHYS



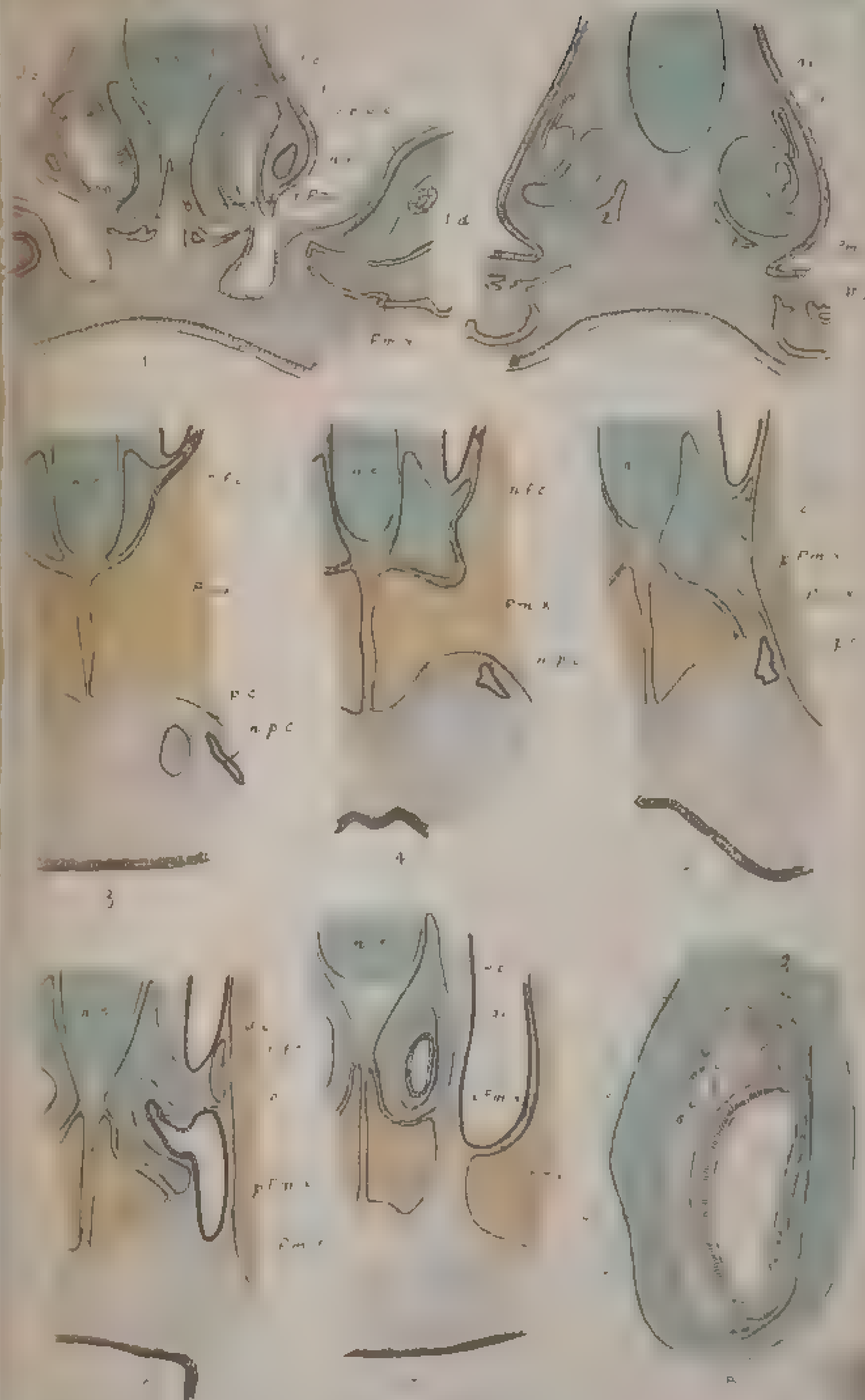
PERAMELES

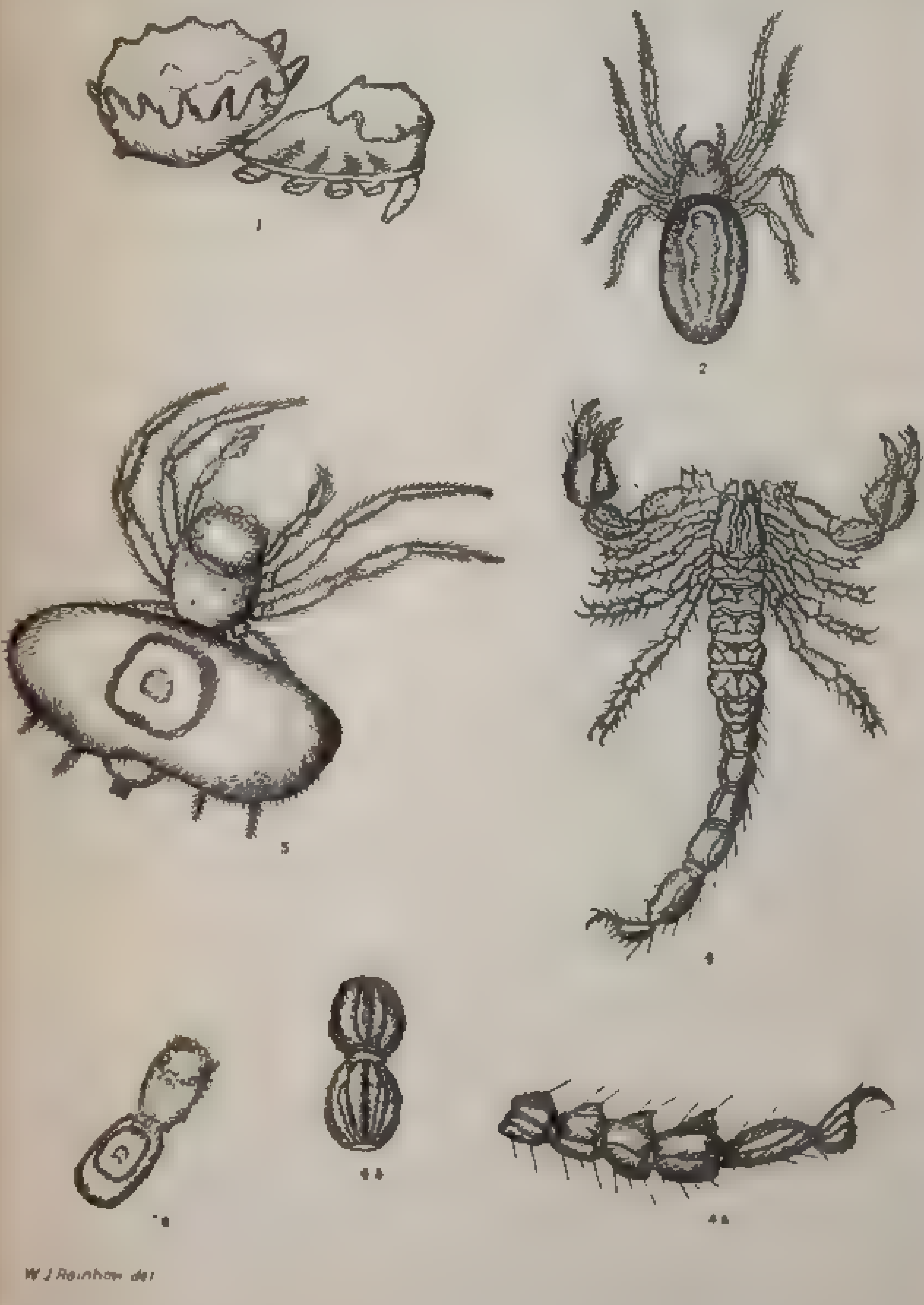


n.s
pPmx
npc
a.n.
Vo
Jo



R B del. MACROPUS

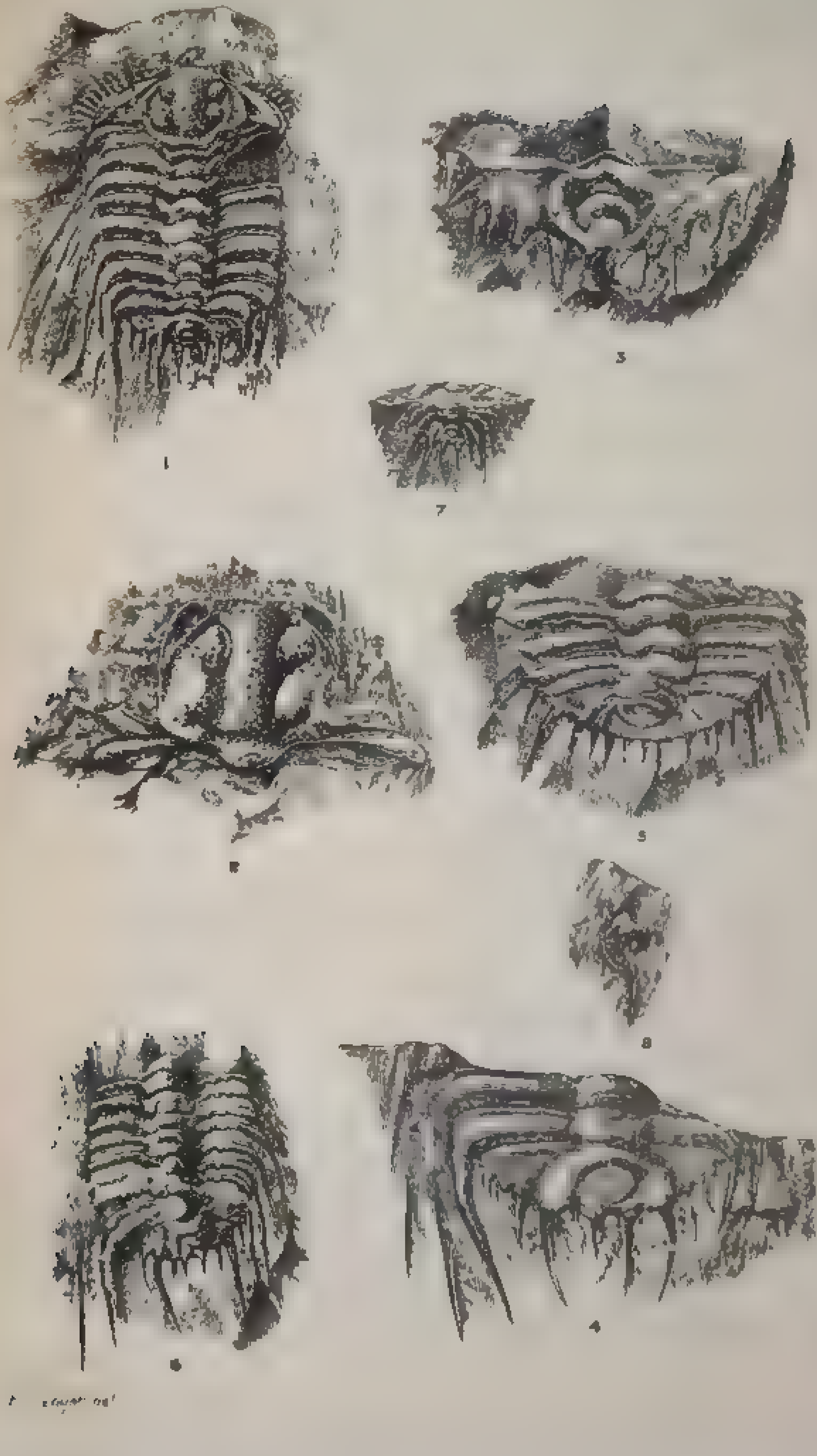




W. J. Rainbow del.

F. R. L[illegible] del.

F.R.Leggett del.



del.

F. R. Leggett del.

P.L.S.N.S.W. 1896

F R Leggatt del

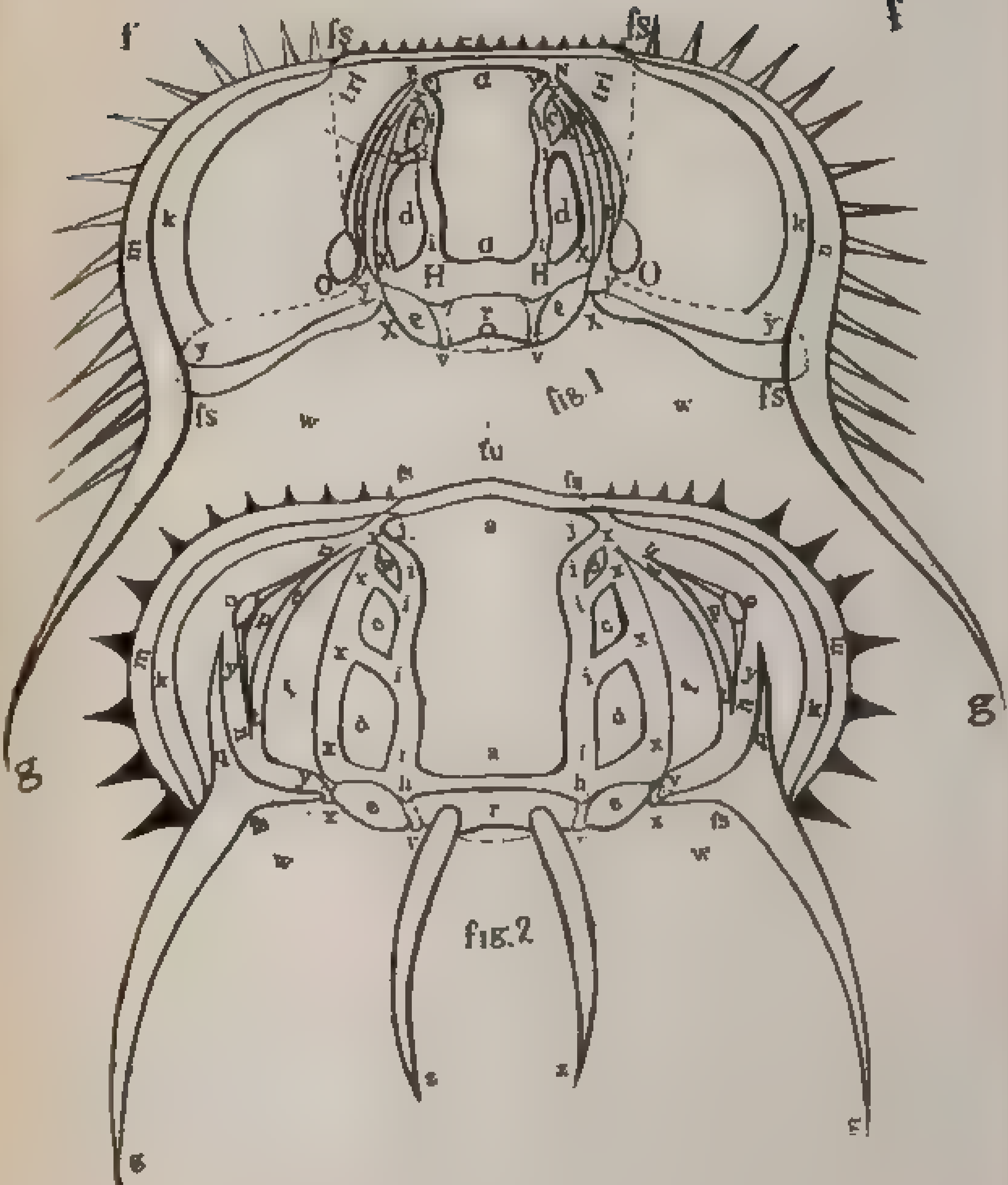
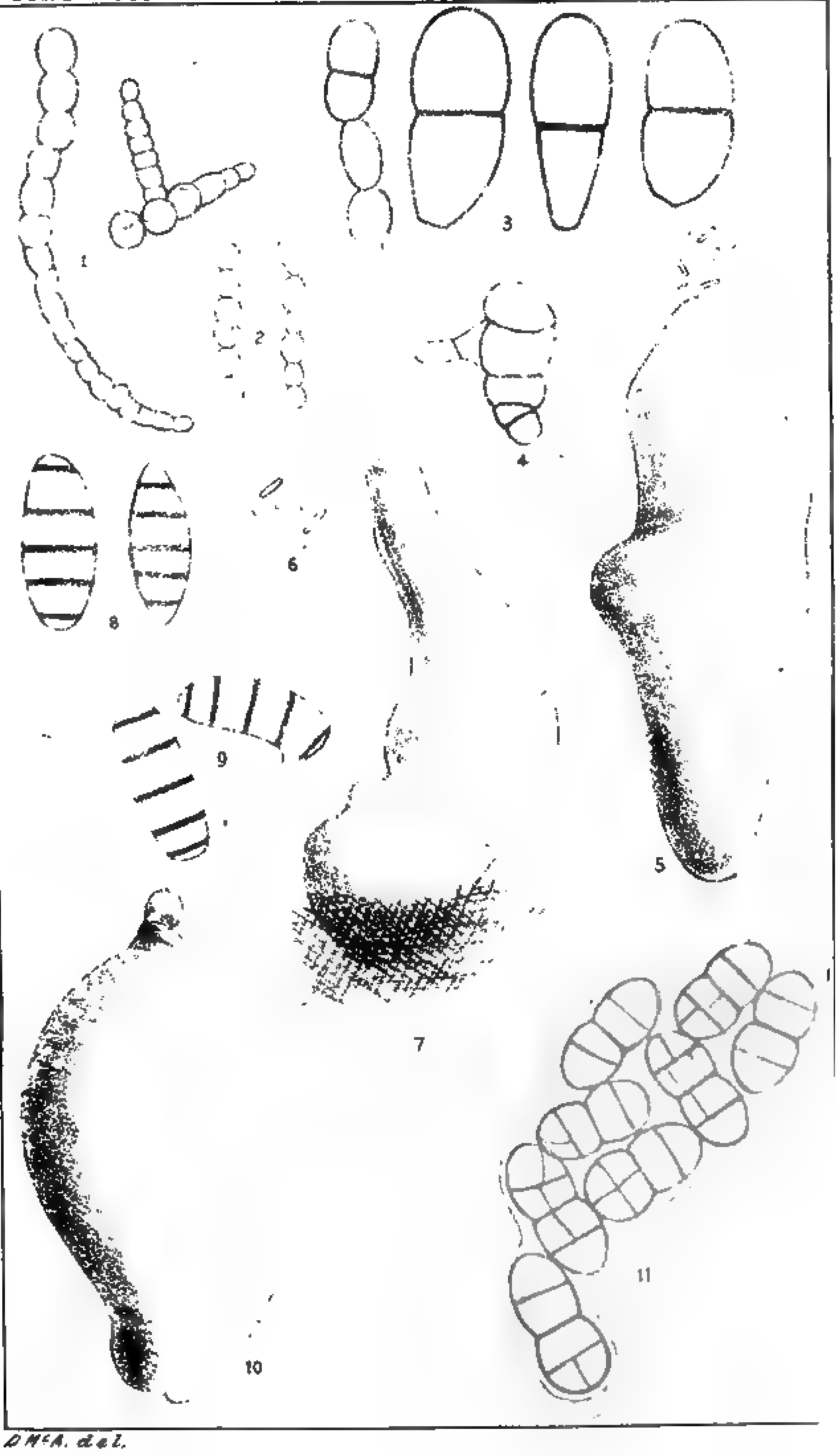


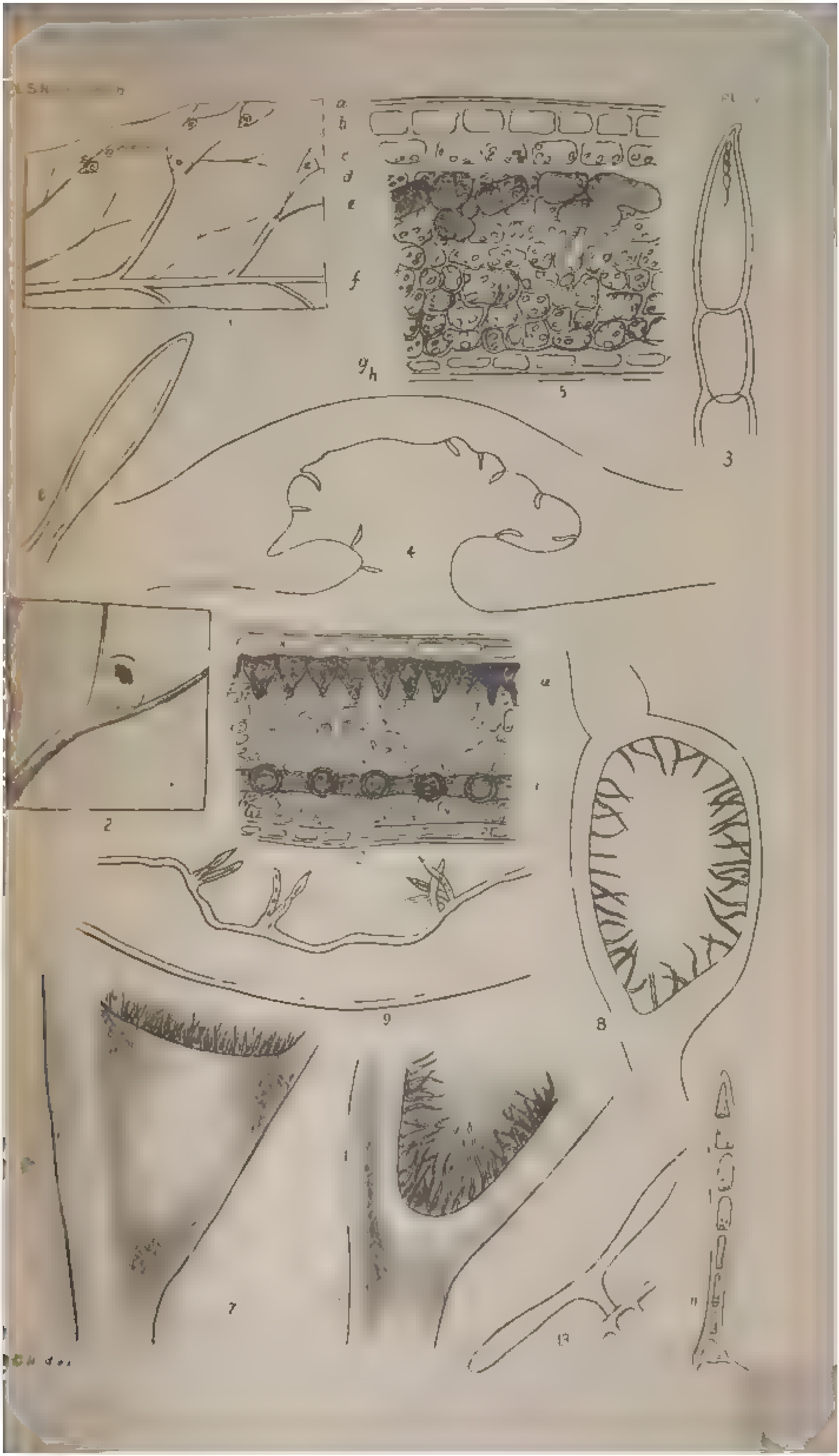
fig. 1

fig. 2

J. Mitchell del.



D. McA. del.



Pl. V
a
b
c
d
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f
g
h
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[illegible]

Papuan Throwing Sticks

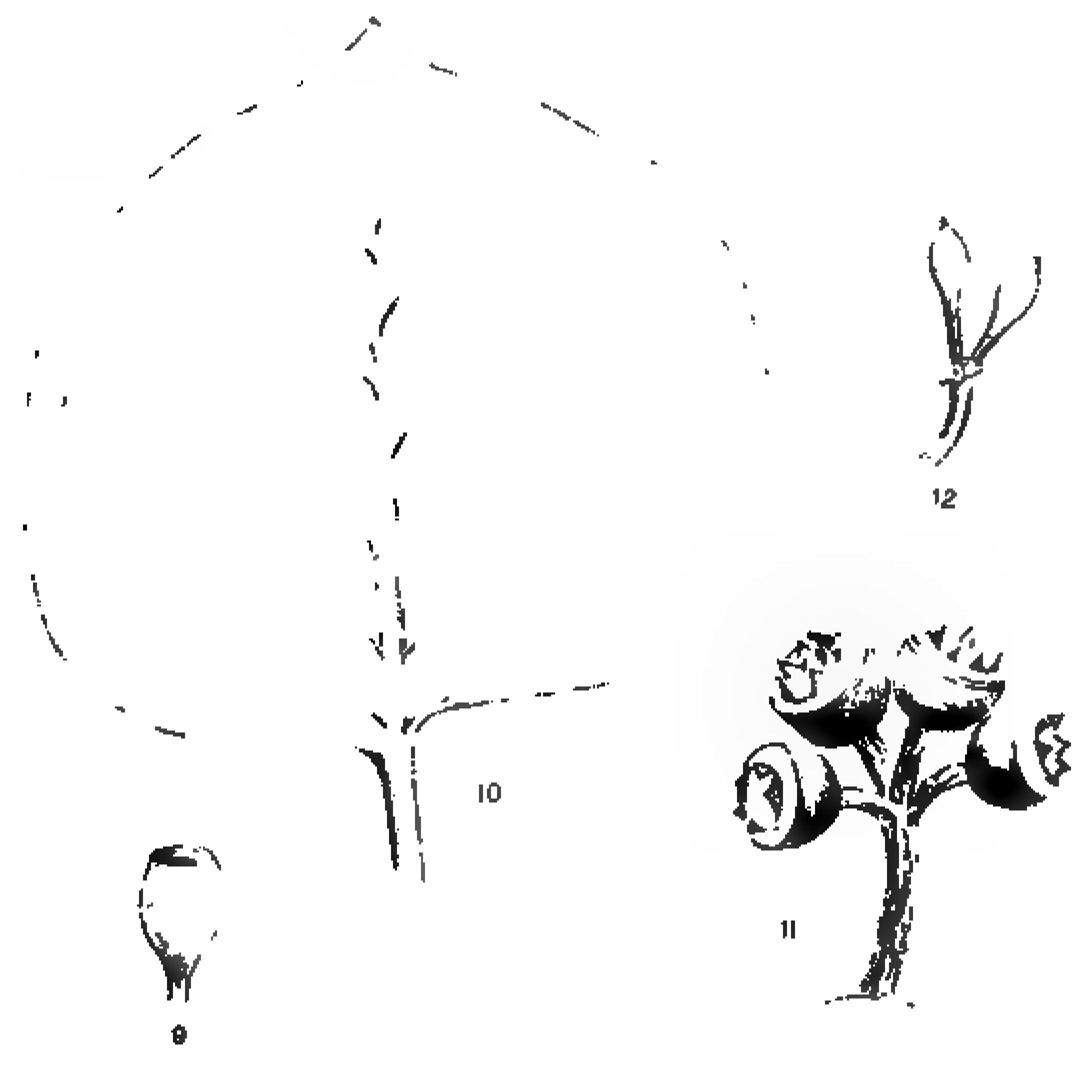
Jennings del.

EUCALYPTUS MACRORRHYNCHA, F.v.M.

R.T.B. del.

EUCALYPTUS CAPITELLATA, Sm.

EUCALYPTUS EUGENIOIDES, 5 in 6



R.T.B. del.

9-10. E. OBLIQUA 11-12 E. sp.

R.T.B. del.

EUCALYPTUS FASTIGATA H.D. et J.H.M.